ARMY ORDNANCE

VOL. XIII, No. 74 SEPTEMBER-OCTOBER, 1932

The Needs of Industrial Mobilization

John Stephen Sewell

Possibilities of the Tank

Maj. Gen. J. F. C. Fuller

The Reduction of Armament

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A Strategic Ordnance Center

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Walter G. Donald

A Challenge to Munitions Preparedness

An Editorial

A BIMONTHLY REVIEW OF AMERICAN MUNITIONS
PUBLISHED BY THE ARMY ORDNANCE ASSOCIATION, WASHINGTON, D. C.

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ARMY ORDNANCE

The Journal of the Army Ordnance Association

Pledged to Public Service in Effecting Industrial Preparedness for War as Our Strongest Guarantee of Peace

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"Certain patriotic citizens have realized the importance of adequate industrial preparation and have voluntarily organized to assist in this work. The Army Ordnance Association comprises such a group, upon which the War Department leans heavily in carrying on the many activities incident to this type of preparation."

Frederick H. Payne, The Assistant Secretary of War.

The Army Ordnance Association

THE Army Ordnance Association is a national organization of American citizens pledged to industrial preparedness for war as our nation's strongest guarantee of peace.

The Association endeavors to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. Should war unhappily come again, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. In an emergency time will not permit careful study or long preparation for the production of munitions. The problem is one of vital concern.

THE Army Ordnance Association believes that the solution of this problem, based on experience, lies in an active organization at all times coöperating with the Government. The principal objective of the Association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an accurate and authentic knowledge of the complex requirements of ordnance. "Peace insurance" in this form is the foremost aim of the Army Ordnance Association.

The Association is purely patriotic; it has no commercial interests, no political alliances, and no religious affiliations. It is not operated for profit: its income is expended in furthering its aims. Its officers and directors serve without remuneration.

ARMY ORDNANCE, the journal of the Association, is published solely for the purpose of disseminating information on the progress of our munitions developments so that American industry may at all times know its responsibilities to the common defense.

The objectives of the Association as set forth in its Constitution are:

To assist in effecting industrial preparedness for war as being one of the nation's strongest guarantees of peace;

To keep available the highly specialized knowledge necessary for arming the manhood of the nation by stimulating interest in the design and production of ordnance material;

To promote mutual understanding and to effect cooperation with American scientists, inventors, engineers and manufacturers in civil life and the regular and reserve officers of the Ordnance Department.

To provide, when required, the services of competent committees to investigate and report upon special ordnance subjects;

To assist in developing and maintaining an efficient personnel, both commissioned and enlisted, for the units required for Ordnance Field Service in the event of an emergency;

To commemorate the services rendered by the industry of the nation and by the officers and civilian employees of the Ordnance Department in the wars in which the United States has been engaged.

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Newton D. Baker

Secretary of War, 1916–1921

Who will be the Principal Speaker at the Fourteenth Annual Meeting of the Army Ordnance Association to be Held in New York City, December 21, 1932.

ARMY ORDNANCE

VOL. XIII SEPTEMBER-OCTOBER, 1932 No. 74

The Needs of Industrial Mobilization

Immediate Requirements for Effective Munitions Security

By John Stephen Sewell*

AT the risk of repeating a definition well known to all readers of ARMY ORDNANCE I would like to recall what we mean by the term Industrial Preparedness. It means such preliminary planning in time of peace, that the industries of the country may be able in a minimum time to come into full production of everything needed by the Army and Navy, in the event of war.

In the cases of clothing, food, medical supplies, surgical instruments, engineering equipment, means of transport, etc., the requirements of the Army and Navy are not so specialized that commercial supplies and equipment are wholly unsuitable, either for direct use, or for the production of things which will do. Although somewhat specialized supplies and equipment are desirable, and it would require some time to produce them, among the things which are commercially available enough can be selected which will at least enable the Army and Navy to get along without disaster due to lack of suitable supplies.

In the case of warships for the Navy, and of weapons and ammunition for both services, matters are quite different. These things are so highly specialized that there is nothing commercially available that can be substituted for them without exposing our fighting men to certain and disastrous defeat.

For the production of weapons and ammunition suitable for use in modern war, in large quantities and at reasonable cost, special noncommercial equipment is needed. No doubt, in some quantity and at very great cost, these things could be turned out by existing plants; but each piece and article would be largely a tool-room job; the rate of production could never be made sufficiently great for a major military effort, and the cost would probably bankrupt even the United States in a prolonged war.

At the time of our entry into the World War, we were in a woeful state of unpreparedness; our force of trained men was almost negligible, and so far as our ability to produce weapons and ammunition was concerned, it simply did not exist. For eighteen months our allies held the enemy while we trained our men and prepared to supply them. We fought the war almost entirely with weapons and ammunition furnished by our allies and only at the end were we prepared to supply our men from our own plants.

SINCE the Armistice, our munitions plants have been dismantled and their equipment junked or scattered. We have a considerable supply of weapons left over from the war, and a small but diminishing amount of ammunition. The capacity of our arsenals to produce these things is but a negligible percentage of what we would need in a real war, and what they have produced and are producing is but little more than that required to keep designs abreast of the times. So far as the production problem is concerned, we are just as badly off as we were before the war—and the next time we will probably have no allies to hold the enemy while we get ready.

Given the necessary arms and equipment, we can train the average young American for combat in from three to five months; but we cannot, under existing conditions, come into full production of his fighting equipment in less than eighteen months. Until the difference between these two intervals is greatly reduced, the work of industrial preparedness is far more important than the training of men. No matter how well trained the men are, they can not achieve victory nor prevent defeat, without weapons and ammunition of approximately the same power and efficiency as those in the hands of the enemy. This means thoroughly modern equipment, for the arsenals and munitions plants of Europe are not dismantled, and they are kept in operation to such an extent that they can start at once on a very large program of production of thoroughly up-to-date weapons and ammunition. In this country, we would still have to design plants and equipment—then build them—then train men to operate them.

If we contemplated an offensive war against a powerful and reasonably well prepared nation, it would take us probably more than two years to make a really effective effort. If we were to be attacked by such a nation, their efforts could probably be brought to a maximum of effectiveness in from four to six months. Under such circumstances we would suffer severely even if we were not wholly defeated.

It seems improbable that we will ever engage in an offensive war against any great power—though stranger things have happened. At any rate, this generation may leave the preparation for such an effort to the generation that proposes to make it. There is no need for us to worry about it. It seems probable that among the powers who might be able to initiate a major offensive effort against us, there is none that, for some years to come, would be financially able to sustain it; but that is a situation which may change very rapidly; and the history of the human race holds out no hope that, when this situation does change, we may not be called upon to defend ourselves.

In fact, it is only necessary to imagine the present effort to bring about general disarmament nearly 100 per cent successful, and that another Genghis Khan should arise in the East, and there would be nothing to prevent Western civilization from being overwhelmed by sheer force of numbers. Our only real defense against that now is our ability to arm

*Chief, Birmingham Ordnance District; Director, Army Ordnance Association; Director of Exhibits, A Century of Progress, Chicago; Colonel, Engineer Reserve, U. S. Army.

our soldiers with weapons that make one of them superior in battle to many not so equipped. Genghis Khan was probably as great a military leader as ever lived, and if his like should appear among the hordes of the East, we could not count on superior military skill alone to defeat him and turn him back. Nor would it be prudent to assume that moral considerations would hold back such a leader and his hordes from plundering Europe and then America, if the handicap of superior weapons were removed.

From a defensive point of view, we have in our National Defense Act the best plan for our own security and for diminishing the frequency of war that has ever been conceived. If made fully effective, it would enable us, within a few years, to secure ourselves against aggression from any power or combination of powers that can at present be visualized. If all nations would do likewise, the cost of military establishments could be greatly reduced, and no nation would lightly declare war against another. They would all be strong in defense, yet almost wholly unprepared for offense.

TO make the National Defense Act fully effective in guaranteeing an adequate supply of weapons and ammunition in case of need, there should be reasonable appropriations (probably from five to ten millions of dollars annually) for a number of years, to be applied to this specific purpose; educational contracts should be authorized; the law requiring contracts to be awarded to the low bidder should be waived in these cases; and the law requiring all arms and munitions to be manufactured preferably in the arsenals should be repealed.

If all these things could be done, we ought to have as a goal to be attained the following situation:

First, each plant capable of being turned into a plant for arms or munitions or both should have its plans completely worked out. The expense of preparing these plans should be paid by the United States. The plans should be revised periodically and kept thoroughly up-to-date.

Second, in each such plant there should be installed one complete unit of the machinery and equipment required to do the work which the plant would have to do in the event of war. Directly or indirectly the cost of these units should be paid by the United States.

Third, from time to time materials required for current use and for accumulating a modest reserve should be actually manufactured in each plant under educational orders, worked out on such a basis as to give to the plant concerned a reasonable profit. Educational orders for any one plant should come along at least as often as once in two or three years and should be of sufficient size to insure maintaining familiarity of the shop force with the work to be done and the equipment with which it has to be done.

Fourth, along with the preparation of the plans and the installation of these units, there should be carried on a careful study with the view to utilizing existing equipment, as far as possible, for early production, even though the cost might be quite high. In the early stages of the war, the combined capacity of all the scattered special units would be appreciable but it would still be necessary to supplement it in every way possible in order to enable us to hold the line while we were mobilizing our full strength and coming into full production. The aim should be, of course, to get into mass production at the earliest possible moment, but in the meantime, no matter what the cost in money, we must produce as much as we can or run the risk of early defeat.

If things could be developed in this way, a great many advantages, both direct and indirect, could reasonably be expected to enure.

THE Ordnance Department has always produced designs of weapons and ammunition of high efficiency, but it has never had the opportunity to solve in time of peace the problem of large scale production at a minimum cost and in a minimum of time. Under the plans above outlined, the United States would secure the benefit of the attention of a great many men who are masters of production. With the incentive of profit added to that of patriotism, if these men were periodically charged with the responsibility of actually producing a small amount of arms or ammunition, there is no doubt that the question of production would receive an intensive study, such as has never been given to it probably in this country or any other. There can be little doubt that if there were an open market for these military supplies comparable to the actual market for, say, automobiles, the manufacturers of this country would probably in a very short time so improve methods of production and possibly even the materials themselves, that the production question would cease to be a problem at all. No such result could be attained under any conditions except those requiring full production for a long time under competitive conditions.

No doubt the study of the production problem by so many competent men would react on the designs themselves so that finally it would bring about a state of affairs where designs would be better adapted to economical production without any sacrifice in efficiency, and where the processes of manufacture themselves would be capable of being carried out with a much smaller percentage of highly specialized equipment. It is probably not impossible that under such conditions we might in ten or fifteen years find ourselves in a position to produce arms and ammunition as rapidly as men could be mobilized and trained to use them. This, of course, would be a 100 per cent achievement so far as the ordnance is concerned. Until we approximate that condition, this industrial preparedness question is far more important than the training of men, and if, under limited total appropriations for military purposes, one or the other should be sacrificed, the training of men would better be sacrificed in favor of speeding up industrial preparedness.

OF course, the state of affairs suggested is quite different from that which exists. A great deal of work must be done before it can possibly be brought about. However, if all of the work which is now being done on factory plans and on the question of early production is done with the ultimate plan in view, a great deal will have been accomplished, and if and when it becomes possible to begin to realize the plan, it will be possible to go ahead with it much more rapidly because of the work that is now being done.

The work which the district chiefs, their assistants and reserve officers of the Ordnance Department are called upon to do in connection with factory plans and in connection with courses of instruction, such as those now being carried on from time to time in each district, is all a part of the necessary preliminary work looking to a final realization of the complete plan. It is safe to say that at the present time there is no work upon which any officer could be employed which will contribute so much to our national security and to minimize the frequency of wars as that involved in the industrial mobilization program of the Ordnance Department.

Possibilities of the Tank

A Reply to Colonel Wagner's Series of Articles in this Journal

By Maj. Gen. J. F. C. Fuller*

IN June last year, shortly after the publication of the first of Colonel Wagner's articles on "Possibilities of the Tank," the Editor of ARMY ORDNANCE was good enough to ask me whether I would care, once this series of articles was completed, to criticise the views of this writer whose ideas, I was told, ran counter to my own. Before answering, I glanced through Part I—"Tanks in the World War," and seeing that at the end of this first round in the attack Colonel Wagner had read several of my books, I decided to do so.

Having now carefully studied Parts I, II, III and IV, what has interested me most is the spirit in which they are written. Here is the old enemy, the G.H.Q. mind, in all its prestine virility; just as active and obtuse as ever; just as shocked by a novel weapon as our great grandmothers would have been by a lip-stick, and just as ready to see in every fault made and every difficulty encountered damning evidence of inefficiency and uselessness.

During the War the General Staff of the British Tank Corps was opposed by this mind—this reactionary, conservative spirit. Compared to it, the enemy, gallant and able as he was, faded into insignificance; for his opposition was as nothing compared to the opposition of G.H.Q. The true enemy of the Tank Corps was in rear of it and not to its front, and what made things extraordinarily difficult was, that whilst the Germans attempted only to upset our plans, G.H.Q. attempted to abort them, that is to destroy them in the womb and not merely in the field.

In fairness to the G.H.Q. mind, it must be said that the officers composing it had been fed upon theories which antidated the mechanical age in which we now live, and which above all places finds its origin in the city of Detroit. In 1913 the motor car was still a luxury, today it is a necessity, and in the intervening twenty years the whole of our civilization has been changed by it. In 1913, few British officers owned a car; in 1932 few do not do so. In 1913, G.H.Q. was nonmechanically minded, today the whole of the civilized world and much of the still barbaric is becoming more and more mechanically minded; so much so that walking has ceased to be a necessity and has become almost a luxury—for men and women, and more so boys and girls, anyhow in Europe, seek relaxation by walking. In 1914 and the years following, G.H.Q. had this excuse: It did not belong to the motor age, it did not possess a mechanical sense; it had been brought up on shoe leather and horse dung, and these fondly imagined essentials of war were in the marrow of its bones, they were part of its nature, and in the hurly-burly of war the G.H.Q. mind could not change.

Now comes a still more interesting point, the point which really persuaded me to write this reply: Colonel Wagner published his articles in 1931, and in them may be read almost word for word what G.H.Q. said in 1917 and 1918. If he is right, then G.H.Q. was right; if he is wrong, then is his error doubly magnified, for it is an error fourteen years out of date, an error which does not embrace the military progress of these fourteen years only, but what is still more startling—the civil progress. For Colonel Wagner the world has apparently been standing still, and when he looks out on war what does he see? Mars dancing upon a parapet!

This lack of insight into the nature of change, and this lack of foresight into the probable consequences of change, in themselves form a remarkable study, and one worth examining, and one closely connected with the whole history of transportation. I will quote a few examples, for one of my objects is to show that Colonel Wagner represents a type and is by no means a unique event; further still, that this type of thinker has always been wrong, consequently, this digression into past history is really very much to the point.

IN 1669, the first systematic journeys by coach were attempted in England, and then only between Oxford and London. This novelty at once aroused the strongest opposition, a bill being introduced into Parliament "to prevent the effeminacy of men riding in coaches." In 1671, Sir Henry Herbert declared in the House of Commons: "If a man were to propose to convey us regularly to Edinburgh in coaches in seven days, and bring us back in seven more, should we not vote him to Bedlam?" On October 13, 1712, a weekly service was established between London and Edinburgh. The journey there and back was made in thirteen days, and the fare each way was £4.10.0.

In 1641, that is twenty-eight years before the first coaching service was established in England, the Marquis of Worcester, famous as the inventor of an early steam-engine, went to see Solomon de Caus at the Bicêtre in Paris. Marion de Lorme, who was with him when he visited this mad-house, writes:

"We were crossing the courtyard, and I, more dead than alive with fright, kept close to my companion's side, when a frightful face appeared behind some immense bars, and a hoarse voice exclaimed—'I am not mad! I am not mad! I have made a discovery that would enrich the country that adopted it.' 'What has he discovered?' asked our guide, 'Oh!' answered the keeper, shrugging his shoulders, 'something trifling enough; you would never guess it; it is the use of the steam of boiling water'." Why was Solomon de Caus there? To keep his brain from mischief; he had actually suggested that carriages and ships could be propelled by steam!

In 1769, James Watt invented the first practical steam engine. He also was considered mad, but fortunately for posterity he was not locked up. In 1804, a locomotive guided by rails attained the speed of five miles an hour at Merthyr Tydvil, in Wales, and ten years later George Stephenson, financed by Lord Ravensworth, to whom was applied the adage—"A fool and his money are soon parted," began work on the Killingworth railway. He met with immediate ob-

*Major General British Army. C. B., C. B. E., D. S. O. Author: "Tanks in the Great War" (1920); "Reformation of War" (1923); "Foundations of the Science of War" (1925); "Atlantis: America and the Future" (1925); "Pegasus: Problems of Transportation" (1925); "On Future Warfare" (1928); "The Generalship of U. S. Grant" (1929); "Lectures on F. S. R. II" (1931); "Lectures on F. S. R. III" (1932).

struction, Lord Eldon saying, "I am sorry to find the intelligent people of the North country gone mad on the subject of railways."

Stephenson was undaunted, and in 1821, four years before the Stockton and Darlington line was opened, he said to his pupils: "Now lads I venture to tell you that I think you will live to see the day when railways will supersede almost all other methods of conveyance in this country—when mail coaches will go by railway, and railroads will become great highways for the King and all his subjects. The time is coming when it will be cheaper for a working man to travel on a railroad than to walk on foot."

To this the *Quarterly Review* incredulously exclaimed—"What can be more palpably absurd and ridiculous than the prospect held out of locomotives travelling *twice as fast* as stage coaches! We should as soon expect the people of Woolwich to suffer themselves to be fired off upon one of Congreve's ricochet rockets, as trust themselves to the mercy of such a machine going at such a rate. We will back old Father Thames against the Woolwich Railway for any sum. We trust that Parliament will, in all railways it may sanction, limit the speed to *eight or nine miles an hour,* which we entirely agree with Mr. Sylvester is as great as can be ventured on with safety."

ONCE the locomotive began to crawl, the sluice gates of abuse were opened, and its inventor met with obstruction at every turn. A meeting of Manchester ministers denounced the railway as being "contrary" to the law of God. Lord Derby drove the railway surveyors off his land, and Stephenson had to hire a prize-fighter to carry his theodolite in order to prevent it being smashed to pieces. Pamphlets were written and newspapers hired to revile his work. It was declared that the railway would prevent cows grazing, hens laying, and would cause ladies to give premature birth to children at "sight of these things going forward at the rate of four and a half miles an hour."

Parliament supported the reactionaries; birds would be killed by the smoke, foxes would become extinct, horses would be useless and oats and hay unsaleable; country inns would be ruined, boilers would burst and blow passengers sky-high, and finally, the weight of the locomotive would prevent it moving. Nevertheless Stephenson persisted and was besought by William Brougham not to talk too much about speed before the Parliamentary Committee which was to enquire into the question, or else he would "inevitably damn the whole thing and be himself regarded as a maniac fit for Bedlam."

At sea the same opposition to steam-power was shown. It was considered a mad and useless innovation. In 1826, the British Colonial Office asked the Board of Admiralty for a steamer to convey mails between Malta and the Ionian Isles, and what answer did it receive? The following: Their lordships "felt it their bounden duty to discourage to the utmost of their ability the employment of steam vessels, as they considered that the introduction of steam was calculated to strike a fatal blow to the naval supremacy of the Empire."

With the motor-car it was just the same, it was looked upon as a mechanical freak and called a "sparrow-starver." In England, during the nineties of the last century, anyone wishing to make use of one could do so only by first engaging a man equipped with a red flag, this individual not to drive in the car but walk in front of it! At the opening of the present century strange views were held even by thinking soldiers—such as: "Electric ignition is too complicated for use in war . . .," and "Benzine on account of its dangerously inflammable nature, can only be used to a limited extent for vehicles used in war;" consequently, petrol was banned in the British Army until 1912! But the standing objection was the fear that these machines would cause to horses! For what was called "courier work" the motor car was considered useless. One writer says: "It is not likely there will ever be any extended use of motor cars for such purposes," and "The employment of motor kitchen cars, which has also been suggested, is not worth consideration." Yet, as always, there were a few men of vision: "In the House of Commons, on Thursday evening, May 17, 1900, Mr. Balfour [later Lord Balfour] said he sometimes dreamed, perhaps it was only a dream, that in addition to railways and tramways we might see great highways constructed for rapid motor traffic, and confined to motor traffic, which would have the immense advantage, if it could be practicable, of taking the workman from door to door, which no tram-car and no train could do."

Lastly we come to aviation. In 1909, at the first flying meeting held at Rheims several British officers attended, and General Grierson, an able soldier, watching an airplane, turned to General Stone nearby and said: "I say, Stone, do you really think there is anything in it?" and General Stone's comment on this remark (made in 1919) is worth recording: "That is only ten years ago, and it is a very striking fact that such a very short time ago as that some of the best brains in the Army (because I could mention other names, but I do not think it would be wise to do so) thought that anybody who took up flying seriously was a little bit 'gone in the head.' I speak of what I know."

WHY should I have thus far delved into the obstructions of the past? Why should I have gone back to stage coaches, to long forgotten Parliamentary reports and review articles? I have done so because I believe that what I have called the G.H.Q. mind is an integral part of human nature, a Providential resistance, so to say, which induces pressure; an obstruction without which progress would lack its enthusiasm, its conquering spirit, in short this obtusity of mind in the majority of men is the whetstone upon which the minority sharpens its wits and is forced to sharpen them

What Colonel Wagner does not realize is, that such surroundings are always difficult to work in and never more so than when they assume a military form. In civil life there is some liberty, in military life there is none. He is violently critical of the tank and of those who mothered and fathered this new engine of war. Naturally they made many mistakes, for tank organization and tactics did not spring fully armed like Minerva from the head of Zeus. The original tanks were not only novel but crude, and those in charge of them had been brought up to think in every war term except tank warfare; and worse still, their ideas, their suggestions, their plans and proposals were from beginning to end distorted and crooked by the G.H.Q. mind.

Why does not Colonel Wagner mention these supremely important conditions, conditions which unless realized render his criticism out of place if not ridiculous? Why does not he mention that at the battle of Cambrai G.H.Q. scrapped the Tank Corps' plan which was based on holding two battalions of tanks in reserve on the left flank, and in place

insisted upon no tanks being held in reserve and all being put in the front line like a moving wall of China? Why, when the crash came in March, 1918, and the Germans swept the British forces back, does he not inform his readers that the Tank Corps had suggested concentrating tanks at localities from which they could counter-attack in strength, and that G.H.Q. scrapped this plan, and strung the whole of the tanks out in "penny-packets" on a front of 60 miles, a frontage so extensive that their command became impossible and their supply equally so? Why does he not inform his readers that in the great tank battle of Amiens, on August 8, 1918, once again G.H.Q. refused to listen to a tank reserve, and what was worse allotted the only two battalions of Medium A tanks to the cavalry and so cut these machines out of the tactical picture; for tied down to the most vulnerable arm on the battlefield, and the most obsolete, they could accomplish nothing?

Surely he does not do so because he does not want to do so, or because he is so blinded by prejudice that these crucial facts escape him. In place he pours contempt upon what was accomplished under the greatest of difficulties, and sometimes through direct disobedience to higher authority. For example, in April, 1918, G.H.Q. ordered that half the Tank Corps was to be disbanded in order to provide infantry reinforcements; but the Tank Corps, by putting every obstruction in the way, delayed this fatal measure, and had it not done so the battle of Amiens could never have been fought. There was no personal advantage to be gained in this fight for progress, much the reverse, and when August 8 came those who had done their utmost to destroy the Tank Corps crowned themselves with the laurels the tanks then won.

AT length came the end of the war and obstruction was doubled. To save the British Tank Corps from complete abolition something had to be done, and that in a way which would convince the people of Great Britain that the tank was a valuable military machine. At the time I happened to be in charge of tanks at the War Office, and my problem was not only to save the Tank Corps from obliteration but to get a tank designed which would meet the changed strategical and tactical conditions of peace. By much persuasion and no little tank propaganda within the War Office, for from the middle of August 1918 to February 1920 I published a weekly paper called "Weekly Tank Notes" for War Office circulation, I got the General Staff to agree to two designs, a cavalry and a light infantry tank. The first was some 30 feet long and was to be able to propel itself through water, and the second to be not more than ten tons in weight; both were to have a maximum speed of 20 miles the hour.

To cut a long story short, I suggested this high speed—for it was high for 1919—because I foresaw that the slow war tanks were quite unsuited to British strategy. The Empire possessing as it does vast roadless spaces, demanded machines which could traverse them rapidly. I also saw that a swift-moving machine would at once appeal to the Press and through the Press to the public. Eventually, very foolishly, so I think, the cavalry, or Medium Mark D, tank was dropped, nevertheless the light tank was developed into the Vickers Mark I machine, the "spectacular" tank upon which Colonel Wagner pours unlimited scorn.

Why does he do so? As an American why does he object to advertising? Because we live in a vulgar democratic age is no fault of mine or of his, and as we cannot change it, surely it is wise to make the best and the most of it. Advertising definitely pays, and because it does so it does not necessarily follow that the article advertised is jim-crack rubbish. To gain his point, namely, that the tank is all but worthless, he catches upon one word "spectacular" and suggests that my purpose was to produce some totally useless arm, a mere circus-trick affair; yet why should spectacular be thus translated? He accuses me of gross and wilful exaggeration, and apparently to arrive at the truth considers that the best path to follow is that of misrepresentation. When in 1921 I suggested an amphibious machine, which could propel itself from ship to shore and land on an enemy's coast line, he talks of "Grimm's fairly tales"; yet, in 1931, such a machine was built by Messrs. Vickers Armstrongs, and it was not invented, as he says, by Capt. B. H. Liddell Hart. It is true that this machine is in its infancy, but it is certain that, like most healthy infants, it will grow, and when, say in 1945, an amphibious tank swims across the English Channel his jibe about the Republic of San Marino will look very small, almost as small as this republic itself. I have no doubt that the same kind of jest was launched at Fulton's first submarine, yet today submarines can circumnavigate the globe.

TO exaggerate the powers of an actual, that is existing, weapon is undoubtedly wrong, but to picture future possibilities and to explain what a certain type of weapon may and, in all probability, will accomplish when more fully developed is not only right but necessary. Was it wrong for George Stephenson, or for Mr. Balfour, to forecast the future as they did? In any case both their forecasts, exaggerated as they may have seemed at the dates when made, have long ago been surpassed because progress inevitably outsteps imagination.

When all is said and done, exaggeration, when applied to future possibilities, is only another term for imagination. Why should not tanks jump, or float, or fly? There is surely nothing irrational in such suggestions. Yet there will always be found a number of people who are horrified by any suggested novelty, not because it is useless or impossible but because someone else has thought of it first. To them it is an insult for any one to exercise their imagination, or to transcend the G.H.Q. mind. Look at the War; it started with the idea that infantry was the queen of the battlefield, and when this arm proved itself under modern conditions to be no queen at all but a slattern in a ditch, the soldier had to fall back on artillery. The weak point in the gun was its lack of mobility, and the inability of its teams and crews to face rifle and machine-gun fire. The answer to this difficulty was the tank—bullet-proof self-propelled artillery. Then came peace, and back to the queen of the battlefield; back to the walking man with his rifle and bayonet, to the horse-drawn gun and to the trooper and his "yard of blunt carving knife" and spike on a pole. Compared to such an unimaginative return to the stage-coach epoch of warfare, is exaggeration really such a venal sin as Colonel Wagner would have us believe, and is the best way of counter-attacking it to exaggerate in the opposite direction? That is to misrepresent the powers of the tank, not in order to enhance its future but to besmirch its past.

To the lay reader Colonel Wagner's criticism may seem devastating, but to people like myself who have been long connected with the tank, its history and organization, such

criticism as he indulges in appears shallow enough. To me it seems that his fundamental defect is, that in place of relying upon his own ideas, he has ransacked the history of tank warfare in order to discover wherever he can some weak point, defect or error, and then to build his theories on these. In his eagerness to top his unimaginative parapet he has frequently omitted even to acknowledge his sources of information; thus it would appear that most of his maps have been copied out of Capt. Liddell Hart's "The Real War," and that the bulk of his historical information has been extracted from this same book,—incidentally the work of a tank enthusiast. If this is not so, then the following two examples, drawn from many, show how great minds are apt to think alike.

Possibilities of the Tank, Part II.

"The attack took place by battalions in waves less than a hundred yards apart, with the infantry touching almost shoulder to shoulder, a symmetrical line advancing steadily at a slow walk, bayonets up, probably in order to attract the attention of the enemy. That night many of the battalions were scarcely one hundred men strong."

"On March 21, 1918, the dawn was greeted with a crash of approximately 4,000 German guns, followed by a storm of destruction which had not been equalled during the previous years of the War, on a 45-mile front stretching from Arras through St. Quentin to La Fere. When darkness came the Germans had fallen like a flood on the British front for a distance of 40 miles, and a week later they had penetrated the front to a depth of 40 miles, or just to the outskirts of Amiens."

The Real War, p. 253 and p. 413.

"Battalions attacked in four or eight waves, not more than a hundred yards apart, the men in each almost shoulder to shoulder, in a symmetrical well-dressed alignment, and taught to advance steadily upright at a slow walk with their rifles held aslant in front of them, bayonets upwards —so as to catch the eye of the observant enemy. . . . It is hardly remarkable that by nightfall on July 1st many battalions were barely a hundred strong."

"At 4.30 A. M., on March 21st, 1918, the sudden crash of some four thousand German guns heralded the breaking of a storm which, in grandeur of scale, of awe, and of destruction, surpassed any other in the World War. By nightfall a German flood had inundated forty miles of the British front; a week later it had reached a depth of nearly forty miles, and was almost lapping the outskirts of Amiens."

Though such remarkable coincidents as these are somewhat disconcerting, they are of little importance to the general argument. The unreliability of Colonel Wagner's criticism lies in other directions, namely, in erroneous statements and misrepresentations, the latter being traceable in many cases to quotations being torn from their context and misinterpreted. As regards errors pure and simple we find mention of a French 130-ton tank, which is approximately double the weight of the existing shell-proof heavy French tank. We are told that at the time of the Armistice the Allies were short of supplies; this was not so. Never throughout the war were supplies more abundant, and this is proved by the enormous quantities sold after the war. Supplies were not the difficulty, it was lack of good forward communications, and to overcome this the British Government ordered 10,000 cross-country tractors for 1919. We are informed in more than one place that "tanks" were tested out at Aldershot in 1907 and 1908, this was not so. It is true that certain caterpillar vehicles were tested out, but the idea of the tank did not then exist except in Mr. H. G. Wells's fertile mind.

Mistakes such as the above we are all liable to make, but avoidable misrepresentations stand altogether in another category. Thus Colonel Wagner makes a great point of the fact that whilst the British possessed tanks in March 1918 and the Germans did not, the British were defeated and the Germans were successful. Were he an impartial writer and having read my book "Tanks in the Great War," which is clearly an impartial and impersonal history, he would anyhow have pointed out that the G.H.Q. distribution which the Tank Corps was compelled to follow (see p. 172) was such that the tanks were as good as outside the tactical picture—13 tank battalions were stretched out in a cordon on a frontage of some 60 miles! Again, take the 1919 tank plan, fairly fully quoted by Colonel Wagner in Part III of his series of articles. This plan was made out by myself during the summer of 1918 to fit a series of conditions which not only existed at this date but were likely to exist in the spring of 1919. One of these conditions was that even were the Germans to start building tanks at once, by 1919 they would nevertheless have but few, to meet the 6000 to 8000 the Allies were building. This plan was made out for a *definite and particular operation,* and Colonel Wagner must have realized this when he read it in my book "On Future Warfare." What does he say? "Let us look into the case of two industrialized nations facing each other, with the picture drawn by General Fuller of a tank attack on a front *100 miles long,* or say a stretch of ground from Baltimore to ten miles beyond Philadelphia. Sit down quietly and figure out the problem of secrecy, approach, fuel, supplies, ammunition, etc., for this mechanized army, and when this army is finally ready to break loose and overrun the surprised enemy you perceive an army similar, or perhaps superior, to yours leaving the enemy lines and approaching you at a speed of say 20 miles an hour. I will have to leave the result of such an engagement to your imagination."

WHY does Colonel Wagner so distort this plan and *fit it to quite a different operation of war?* There can be but one answer, namely, to down the tank by any and every means. However, such criticism defeats its own end, for it drips with prejudice.

I will take one more example, namely, casualties. Throughout the first four parts of his article he never leaves a stone unturned to prove that because tank casualties were heavy, therefore tanks are useless machines; yet he never states, that because of these heavy casualties infantry casualties were light. At the battle of Cambrai, which I shall refer to later on, with tanks the infantry advanced to a greater depth in twelve hours than they did at Ypres, this same year, in three months. At Cambrai this penetration cost some 5,000 infantry casualties and at Ypres some 375,000. In Part I he quotes figures given by myself, which are official figures. These figures show that though the killed in the Tank Corps were 12.58 per cent compared to the infantry 19.96 per cent the wounded were 70.24 and 64.23, respectively. Colonel Wagner makes no attempt to explain this discrepancy, and this is excusable, for probably he did not know that at least 50 per cent of the wounds suffered in tanks was due to "splash," that is to particles of incandescent nickel and lead entering through armor joints, etc., solidifying and hitting the men. Of wounds due to "splash," none, as far as I can remember, proved fatal, and many of them were little more than scratches which as they had to be treated for antitetanus were classed as wounds. When quoting these casualty figures Colonel Wagner might, however, have added what I wrote immediately under them: "This low

figure in killed was not due to the men in the Tank Corps taking part in fewer actions than the other arms; in 1918 few infantrymen led the assault of a pitched battle more than four times, many tank soldiers did so as many as fifteen times." In fact, during the last three months of the War the cry for tanks was so continuous and persistent that little time was even obtainable for repair work; irrespective of the condition of the machines or the crews, tanks were hurried forward from one point to another, and the gallantry displayed by both officers and men deserves, so I think, a more chivalrous pen than Colonel Wagner's to describe it.

WHAT is at the back of all this misquotation and misrepresentation? Dishonesty—No, I do not think so; but a far deeper-rooted disease, which for the lack of a better name I will call—"Wagneritis"; a universal complaint, and one which has confronted the inventor throughout history. Here is a man who presumably took part in the war, and who is the consulting engineer of a well-known company. What possible gain can he derive from exaggerating the weaknesses of the tank? The honesty of his opinions is so certain that he cannot see how distorted they really are. His outlook upon war is fixed between the years 1914–1918, and outside these four years war is a complete blank to him. To those who see as he sees—salvation; and to those who see beyond 1918—damnation. His honesty possesses almost a religious fervor. This is the fundamental itch in Wagneritis.

To me he seems to be like a man who having witnessed the gun-boat exploits on the Tennessee, Mississippi and other rivers during the American Civil War, is so petrified by what he saw, that fourteen years later, seeing warships as they then are like, he cannot resist turning upon their designers and condemning them not in terms of 1879 naval possibilities but in those of 1862. To him all wars apparently must be siege wars, just as to my hypothetical witness all naval wars must be river operations. He does not see that it was the impotence of infantry in the attack which created a war of trenches. He does not see that it was the bullet which introduced the spade, the spade the trench, the trench wire entanglements, and these entanglements the multitudes of shells. He does not see, or cannot realize, that the tank, in spite of its crudeness and imperfections, in spite of the ignorance of those who handled it, and in spite of the many mistakes made, *did* counteract the bullet, and, consequently, disentangled, unskilfully perhaps, yet nevertheless conclusively the dreadful tangle of trench warfare and made field warfare once again possible.

Though the tank was built for a siege war, does Colonel Wagner really think that its full powers are best developed in such a war? Cannot he see that had tanks existed in numbers at the outbreak of the war there would have been no war of trenches as we know it? Does he really think that if war were declared today an invading army would at once be confronted by thousands of miles of trenches, by tens of thousands of miles of barbed wire, by 100,000 machine guns, 15,000 field guns and 5,000 heavy guns as the first tanks were in 1916 and 1917? Does he suggest that because Foote's gunboats at Fort Donelson, in 1862, were limited in the extreme, these limitations are inherent in every warship that can be built, and in every naval operation that can be fought?

The full powers of the tank cannot be developed in siege warfare, this is surely obvious. The idea of the tank is simply the idea of an armored horse. What kind of warfare does the horse, armored or unarmored, like? Is it siege warfare or field warfare? What kind of a war does a warship like? Is it bayou fighting or open-sea fighting? Really these questions are too absurd to answer; a Sandhurst, or a West Point, cadet would simply laugh at them. Let us examine the facts, certainly, so as to discover our mistakes; but do not let us do so in order to accentuate them, and so prove that these mistakes count for everything and that from successes nothing can be learnt. Those who have no sense of proportion or of perspective, who see all things they want to see asquint and out of focus, are suffering from that devastating mental complaint—Wagneritis, a plague which blinds them to reality and quite unconsciously turns them into dishonest men. I will now take the battle of Cambrai as an example.

THERE has been a great deal written about this battle, and a full and, I think, accurate account of the part tanks played in it is given in my "Tanks in the Great War"; yet Colonel Wagner's knowledge of it is sketchy in the extreme. He says: "On November 20, 1917, at Cambrai, four hundred and seventy-six British tanks, without any preliminary bombardment, in a surprise attack rolled over the German Armies almost at will. This was the first actual meeting in the field of war, consequently it was something which had not been prepared for and, due to the surprise attack, led to a very successful issue, hence the tank was immediately hailed the panacea for the misfortunes of battle." As a matter of fact, tanks were first used on September 15, 1916, and had fought at Arras, Messines and at Ypres before the battle of Cambrai took place. At Cambrai they accomplished what the Tank Corps had claimed they would accomplish, hence their success was no surprise. As regards the German counter-attack on November 30, he writes: ". . . ten days after the tanks had met with such phenomenal success in a surprise attack, the Germans in turn, and without any tanks at their disposal, surprise-attacked the British at Cambrai and were successful in driving them out of their hard-earned positions." He does not, however, inform the reader that shortly before this attack took place all the tanks had been withdrawn to refit, and that shortly after the attack was launched, the tanks of the 2nd Brigade, then in a non-fighting condition, were hastily got ready, and by means of a counter-attack stopped the German attack in the vicinity of the village of Gouzeaucourt. His outlook on this battle is so prejudiced that it may be of some interest to the reader if I briefly outline some of the difficulties which were encountered and overcome.

For over six months the Tank Corps had urged upon G.H.Q. the feasibility of replacing the wire-cutting bombardment which at Ypres cost £22,000,000, by a surprise tank attack, and on August 3, 1917, a scheme was submitted suggesting such an attack in the area immediately south of Cambrai. Why this area was chosen was because its defences were so formidable that an attack there would not be suspected; the ground was un-shelled, and as the idea was to carry out a raid and not to fight a decisive battle, the canals flanking the area suggested would for a few hours protect the flanks of the raiding force. For eleven weeks nothing was done, then suddenly, on October 20, the Headquarters of the Tank Corps were ordered to prepare for a break-through attack on November 20. The original idea

had nothing to do with a break-through, and for such an attack the canals so confined the area that it was impossible to enlarge the frontage of attack by pushing tank forces to the right and left of the gap created. This was pointed out to G.H.Q., but in my opinion the Chief of the General Staff was so certain in his own mind that the attack was too fantastic to prove successful, that in his opinion it made no difference whether the canals could or could not be crossed by tanks.

Once the battle was ordered the following work had to be carried out in less than a month: A tactics made out, some 40,000 men trained to carry it out; a means invented which would enable a 26-foot tank to cross a 12- to 18-foot wide trench, and, what was far more difficult than all these things put together, to convert such who were suffering from Wagneritis that the attack was a feasible one. For instance, one Divisional Commander said that he had never heard of anything so fantastic in his life, and that it was nothing short of murder to ask infantry to follow tanks. Though the tank tactics devised by the Tank Corps General Staff were adopted by G.H.Q. and the Third Army Headquarters, this General set them aside and the result was the check on the Flesquières ridge, the only check of importance which occurred on the first day of the battle.

The trench crossing difficulty was solved by what was called a tank fascine, a great bundle of brushwood made out of a number of ordinary fascines and carried on the nose of each machine. When a wide trench was encountered, by means of a quick release operated within the tank it was tipped into the trench, and there acted as a support for the tail of the tank as it crossed over. In the making of these tank fascines 21,500 ordinary fascines were used, and to make these 400 tons of brushwood had to be cut, and what was more perplexing 2,000 fathoms of chain collected in England.

The training was pushed on at top speed, and as few infantry officers believed that the tank could possibly accomplish what the Tank Corps said it could, each unit was told to build its own experimental trenches and construct its own entanglements. One unit, I remember, dug a trench ten feet deep and fifteen feet wide, and protected it by an entanglement eight feet high the pickets of which were 9-inch pit props, and twisted between these was barbed wire so thick that one could barely see through it. It looked an impossible obstacle to cross, yet the tanks went through it like elephants through a sugar-cane plantation.

All these many difficulties were surmounted with ease, but one still remained to be surmounted, and because it was not surmounted the battle was virtually wrecked before it began. The Tank Corps plan was worked out to fit the ground; in the plan it was suggested to put six of the nine battalions of the Tank Corps in line in order to lead the van of the infantry advance, with two battalions in reserve on the left flank and one on the right flank. The two on the left flank were, once the trench zone had been penetrated, to move onto Bourlon Wood, strategically the key position, then to swing eastwards onto Cambrai, the importance of which lay in the fact that it was the main railroad center in this area. This plan was strategically and tactically sound, and had it been accepted there can be little doubt that the battle would have been a far greater success than it was, and that the German counter-attack on November 30 would not have taken place. What prevented its acceptance? Fear that the tanks would fail to do what the Tank Corps said they would do. Fear is failure, hence the Tank Corps' motto is "Fear Nought." The Third Army Commander believed in tanks, but his faith was not deeply founded. G.H.Q. did not believe in them, and the result was that the Tank Corps' plan was scrapped and an order issued for *all* tanks to form up in line during the night of the 19/20 November and advance like a moving wall at dawn on the 20th. No tanks were held in reserve, there was no infantry in reserve, and when the French offered G.H.Q. a corps to support the attack, G.H.Q. refused it!

If ever a battle was wrecked by its higher command it was the battle of Cambrai. I have still in my possession a copy of a memorandum I placed before General Elles, commanding the Tank Corps, in which I pointed out that if the G.H.Q. plan stood fast the battle could only be "a one-day affair," and this is really what happened.

When all these points, and there were many others, are taken into consideration, Colonel Wagner's criticism of this battle assumes quite another complexion.

CAMBRAI was a revelation to the unbelieving, it showed that the crudest of crude machines—the Mark IV tank (veritable "Merrimacs" and "Monitors") could replace the artillery bombardment, and far more effectively. At Cambrai 4,000 officers and men of the Tank Corps accomplished in 12 hours what 120,000 gunners at Ypres, the same year, failed to accomplish in 12 weeks. Had all the 476 tanks which took part in this battle been shot to pieces, in money the loss would have been approximately £2,500,000. As I have already mentioned, the 107,000 tons of shells fired in the preliminary bombardment at Ypres cost £22,000,000. For this sum, which was completely wasted, 4,400 tanks could have been built. More important than money was the fact that whilst the artillery bombardments destroyed all forward communications, replacing the enemy's trench zone by a crater zone which was even more difficult to cross, the tank attack in no way injured the ground.

In spite of this, no one in their senses today would prepare to fight another battle of Cambrai, because no one unafflicted by Wagneritis can believe that at the beginning of the next war the attacker is going to be confronted by a Hindenburg zone five miles deep, and by seas of wire entanglement protected by thousands of guns. I am in entire agreement with Colonel Wagner that it is possible to build a tank-proof zone of forts, and if, for example, the Poles have a few thousand million dollars at their disposal, they can prevent even a single Russian tank crossing their frontier. I also believe that if the British want to invade France by a direct land attack the surest way to do so is to fill up the English Channel. When money is of no account all kinds of extraordinary things can be accomplished.

Granted that zones of tank forts are sound and practical defences of quite short frontiers, but are really impracticable for extensive ones, and even if built will not frustrate air attack, what does Colonel Wagner suggest? It is difficult to say, because after having demolished the tank he does not even hint what he would do. Apparently, in spite of the lessons of the last war, he still believes in hordes of infantry supported by thousands and thousands of guns. The infantry to be armed with "a number of large-caliber automatic rifles," and the artillery shells to be filled with thermite; yet what for I cannot imagine, as a direct hit on a tank track is

quite sufficient to put the machine out of action, and after all the tank is not made of cotton-wool.

He does not believe in surprise, he says: "Surprise attacks by tanks, in my opinion, are greatly a matter of the past provided the object lessons taught by the recent war are not pigeon-holed and forgotten, and it does not require much imagination to perceive that every future army commander will be on the alert for such surprises." Of course they will, but why not stretch imagination a little further; why imagine that the next war when it comes will not be different from the last war? Why not imagine that it will be different, anyhow the world has moved on since 1914-1918. Would it have been wise, for example, had Admiral Togo at Tsushima applied the tactics of Hampton Roads?

He does not believe in speed, that is in mobility; he writes: "We speak of building tanks with speeds of 40, 50 and 60 miles an hour. What assurance have we that we will have an opportunity to use such speed in actual warfare, except perhaps to get out of the mess when it gets too hot for us?" Of course we have no definite assurance, because as Clausewitz says: "War is the province of chance." Yet getting out of messes is a most important part of generalship, because the quicker one can get out of them the quicker can one get the enemy into them, and if he does not possess his opponent's speed obviously he will be at a disadvantage. I would like to ask Colonel Wagner this question: Supposing on active service he were in command of a battalion of infantry, and I came along and offered him a packet of tabloids which when swallowed would enable his men to march 6 miles an hour in place of 3, would he or would he not accept it?

He does not like smoke. "The tank," he says, "may employ a smoke screen to conceal their advance, but smoke is at the same time a detriment to the tank, since the guiding spirit of the tank cannot see just what it may encounter, and the defending army's artillery will certainly search such a smoke screen." Does he suppose that in such operations all the tanks will emit smoke? Has he never seen a section of smoke-producing machines move off to a flank, say a mile away, and generate a flanking cloud a mile long? I cannot imagine that he ever has, or else he could not write such clap-trap as this.

What does he like, what does he believe in, what does he suggest? At length we get the answer vague though it may be:

"Know your matériel as well as that of your enemy. Recognize the limitations of both and do not attempt to accomplish the impossible unless the sacrifice is unavoidable."

In other words—commit suicide; for if an operation is impossible, to attempt it at all is the act of a fool. Far better put your hands up, Colonel Wagner, and surrender at call.

Curious Clients But No Buyers—Scene at a Recent Sale of Antiquated Weapons in Paris, France.

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A Cardinal Element of Our Munitions Preparedness Plan

By M. E. Singleton*

IT was a very natural thing to establish the District Ordnance Office in St. Louis. Eighty years after Marquette, Joliet and La Salle had traced the Mississippi from its source to its mouth, the little trading post of St. Louis sprang up. This was in the year 1762. From its foundation to the present time the city has always fostered the manufacture and supply of a great variety of articles necessary in the development and defense of the country. From its river shore at an early day traders and trappers paddled up the Missouri and up and down the Mississippi. Those intrepid pioneers of the Oregon and Santa Fe trails bought their stores and organized their parties in the little trading post for their long trips overland. As the development of the country progressed, St. Louis contributed its share of manufacture of railroad material, leather goods and canvas articles. This fact together with the present production of steel, chemicals, electrical goods, machinery, and a variety of other manufactured products brings the outfitting functions of the city abreast of the new requirements of the growing country.

The Great War witnessed a radical change in the method of ordnance procurement. As the ordnance program gathered volume, it became apparent that the policy of decentralization would be necessary to relieve the jam at the front door, which was Washington. One of the first to sense this changing policy was the late Guy E. Tripp, Chairman of the Board of the Westinghouse Electric and Manufacturing Company, colonel and afterwards brigadier general in the Ordnance Department and Chief of the Production Division. General Tripp, considered one of the outstanding industrial leaders of America, lent his characteristic initiative to the decentralization plan, and the Ordnance Districts throughout the country sprang into existence.

The set-up of the district organization was patterned after that in use by the Ordnance Department in Washington. The district chief was in effect the chief of ordnance in his particular area and, as such, was responsible for the administration of the district office, the ordnance production allocated to the district, the inspection at the various plants engaged in the manufacture of ordnance matériel together with the finances and other services in the area. Ninety per cent of all contracts in the district were turned over to the district office, control of the remainder being retained in Washington for special reasons.

As was to be expected the idea of decentralization was opposed by some executives of the Ordnance Department at its inception. However, this objection was somewhat dissipated as the results began to appear. See how true to form we run. It is always an incident of any step involving the devolution of power—the reluctance of men to let go what they already had put their hands to. But in this case the Russian proverb is in point: "The Cossack has caught a Tartar and the Tartar has him by the hair." The tremendous size of the job required a strong hand at the wheel, one who was accustomed to the administration of large enterprises and one who knew when to let go and how to do it with least jar to existing mechanism. Fortunately the Ordnance Department had in General Tripp the right man for this job.

The district offices and their chiefs were as follows: Boston, Levi H. Greenwood; Bridgeport, Waldo C. Bryant; Chicago, Edmund A. Russell; Cincinnati, Charles L. Harrison; Cleveland, Samuel Scovill; Detroit, Fred J. Robinson; New York, George J. Roberts; Philadelphia, John C. Jones; Pittsburgh, Ralph M. Dravo; Rochester, Frank S. Noble; St. Louis, Marvin E. Singleton. Two other District Chiefs were appointed after the Armistice to conduct the settlement of contracts in their areas. These were: Baltimore, Lieut. Col. A. V. Barnes; Toronto, Lieut. Col. Orton W. Albee.

The district ordnance picture therefore shows St. Louis, sometimes described as "A city surrounded by the United States," in a strategic position. With its 26 railroads and extensive river system it holds a commanding position in the transportation scheme of the country.

THE St. Louis Ordnance District, the last of the districts to be formed, was geographically the largest district in the country. Roughly speaking, its northern and eastern boundary was the Missouri River, and its other boundaries were the frontiers of America—the Rio Grande, the Canadian Border, and the Pacific Ocean. The district originally included 16 states of the Middle West, Southwest and Western sections of the country, together with two-thirds of the state of Illinois. Its area of 1,717,000 square miles included more than one-half of the continental area of the country and about one-fifth of the country's population.

The munitions manufactured in the district were rather diversified. This, of course, would be expected on account of its size. The city of St. Louis was the shell center. Three important plants—the Scullin Steel Company, the Wagner Electric Manufacturing Company, and Curtis & Company—had been prepared for the manufacture of munitions for the United States Army by having Allied contracts before our entrance into the war. This fact has left in the minds of many people the idea that our manufacturing plants were able to get into munitions production very easily when the United States entered the war, when as a matter of fact they simply changed from the manufacture of munitions for the Allies to that of manufacturing ammunition to serve our own troops. It would indeed have been a different picture if our plants had not the very good fortune to have had these educational orders from our Allies together with the advance notice caused by the fact that our entrance into the war was anticipated for months beforehand. We may not have this good fortune again should we unhappily ever be forced to defend our country. In the vicinity of St. Louis there were in operation four great cast-steel shops, making ingots for various sizes of shells. There were also three great shell forging shops and three great shell machining shops.

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In addition, there were under construction on November 11, 1918, two forging shops and two machining shops for the manufacture of 8-inch and 9.5-inch shell. The combined capacity of old and new shops would have been 540,000 shell per month. There were also manufactured in the St. Louis metropolitan area adapters, fuzes, gages, containers, bolos, bandoliers, pyrotechnic material and ammonium nitrate.

The district upheld its reputation for fast and satisfactory shell production in its program for the production of ammunition for small arms. It was the good fortune to have located at East Alton, Ill., the progressive plant of the Western Cartridge Company where, between April, 1917, and December, 1918, were turned out 46,018,000 rounds of caliber .30 service ammunition. The plant attained a daily production of about 1,000,000 cartridges with plans for stepping-up this production to 3,000,000.

In addition to the production of artillery shell and small arms ammunition the district, due to its widely scattered industrial centers, was also able to supply picric acid at Little Rock, Ark.; sulphur and oil in Texas; containers for smokeless powder in the southwest; semisteel shell at Kansas City, Mo.; spelter in Oklahoma; TNT at Hercules, Cal.; potash from the seaweed of the Pacific coast, and black walnut for rifle stocks in a number of western states.

The district performed its full share in developing certain processes used in the production of what had always been considered strategic material. These developments, the results of intensive study by American manufacturers, constitute a bright spot in the history of industry. Before the war practically all the potash for conversion into saltpeter, used in making military black powder, was purchased from Germany. A few months after our entry into the war, the Hercules Powder Company was extracting potash from Pacific coast seaweed at the rate of 500 tons a month. The potash was shipped as potassium chloride and converted later into potassium nitrate. The kelp from which the potash and other materials were extracted was taken from that which was cut by great seagoing harvesting machines off the California coast. A number of barges collected the kelp from the harvesters and deposited it in docks of San Diego where it was cut-up, beaten and then piped inland to the plants where the manufacturing processes were in operation. Early in the Spring of 1917 the Hercules Powder Company had four TNT plants in operation at Hercules, Cal., with another plant in operation in the first part of 1918, bringing the monthly capacity up to 2,500,000 pounds. A few months later this capacity was increased to 6,000,000 pounds of crude TNT per month.

The story of black walnut for rifle stocks is not generally known. A year or so before the start of the Great War, Germany was buying up all the black walnut flitch that was being produced from the lumber mills in the United States. This heavy demand had exhausted a large part of the ready supply of this material with the result that the Ordnance Department had as many as fifty men engaged in searching for walnut trees shortly after our entry into the war. It must be remembered that the walnut tree does not grow in forests but ranges from a single tree to a small group of trees. The entire central west was combed thoroughly to this end with the result that there was no lack of walnut to place rifle stocks in the hands of every fighter on the Western Front and the men in training camps in the United States. Keeping pace with the story of black walnut and kelp in the St. Louis district, were three other phases of industry—cottonseed hulls, dolomite stone and nut shells.

The St. Louis district, although perhaps more favorably situated than the Eastern seaboard, shared with others the shortage of common labor and skilled mechanics. To meet the shortage, 20,000 women entered positions previously held by men. The war-time experience of the district was that personnel was the vital factor in expansion programs, not new buildings or additional equipment. It is hoped the Ordnance Department will always bear in mind this war-time experience of the St. Louis district in connection with its emergency expansion program for industrial plants. We must never forget that after all is said and done, personnel and particularly supervisory personnel is the factor which governs the degree of expansion of any industrial plant.

In connection with importation of labor for emergency munitions production, it is desired to record, for future guidance, the district's experience in this activity. In building at Little Rock, Ark., the only Government picric acid plant that got into production before the Armistice, a heavy labor turnover was encountered, no less than 13,490 men having been employed from time to time. After a great deal of labor turnover from states in the southwest, Washington was appealed to. The Department of Labor secured 1,436 Puerto Ricans but the experiment proved unfortunate. These island workers were barefoot, thinly clad, poorly fed, in a strange land speaking a strange language. They lost their spirit, homesickness seized them and influenza reaped a harvest of death among them. It was two months before a vessel could be had to return them to their native island. When they embarked they left 176 of their number in a little grave yard overlooking the Arkansas river.

The present year marks the tenth anniversary of the establishment of the post-war St. Louis Ordnance District. A considerable amount of water has flowed over the dam during these ten eventful years. Much has been accomplished in mobilizing the district's industrial resources. A great deal remains to be accomplished. In the post-war program, to the district's everlasting good fortune came a man of vision and tremendous energy in the person of Colonel Harry Scullin, Ord. Res., President of the Scullin Steel Company, who was appointed Assistant District Chief in 1927. With the able assistance rendered by Colonel Scullin, the principal industrial plants in the district have coöperated to the fullest extent in shaping a program that would tend to eliminate the costly mistakes of getting into production encountered in the World War. The district was also exceedingly fortunate in having in its organization, Colonel E. D. Campbell, Ord. Res., who was an Ordnance officer engaged in the design of railway artillery during the war and who is at present Chief Engineer of the American Car and Foundry Company. Colonel Campbell, as president of the examining board for reserve officers, has been instrumental in building up the district officer personnel to a high degree of efficiency. The officers now assigned to the organization present a typical cross-section of the professional and industrial life of the district.

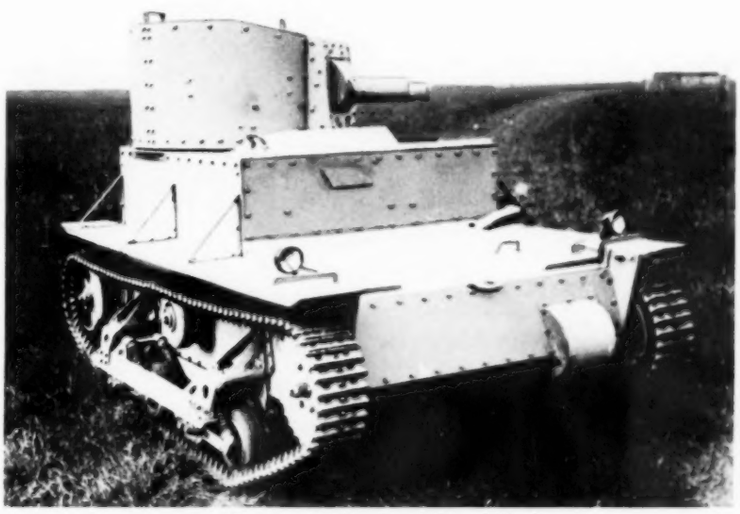
The present generation remembers only too well the trials and difficulties encountered during the World War production of munitions. Eternal vigilance is the price that must be paid in an endeavor to mobilize the industrial resources of the nation to such potential strength as to make most improbable the chance that we will ever have to use it.

The Modern Ultralight Tank

A Combat Vehicle With a Distinctly Useful Sphere

By Robert J. Icks*

IT has often been said that tactics produce weapons but it is equally true that weapons cause modifications in tactics. The tank of the World War came about through a definite need after the stalemate of the Western Front began, and, in turn, caused a modification in tactics which is still taking place. As long as there is an improvement in matériel this will continue. The tank has made such rapid strides mechanically that there is little wonder that it has stirred the imaginations of military men throughout the world. It is a weapon of tremendous possibilities, but in a limited sphere as yet. Therefore, it is dangerous to advance too far in the formulation of definite tactical procedure based on weapons which are untried as is the modern tank. Similarly, the other extreme has its dangers, where the too conservative frame of mind refuses to admit the possibility or desirability of any change or modification in tactics. The whole matter is in a state of flux, and if the tank has done nothing more, it has caused the military world to recognize, in varying degree, the value of the gasoline engine as applied to military uses.



The Vickers Carden Loyd Patrol Tank.
The turret gives a field of fire of 360 degrees.

We are not definitely committed to any system of tactics, mechanized or otherwise, but endeavor to advance cautiously. During the war, it was necessary for us to conform to the usages of the Allies, and in line with this, the tanks which were adopted were the light Renault type of the French and the Mark VIII based on heavy British practice. After the war, experiment continued with pilot models in the medium class and more recently, in the light class. Limitations to these two types has been due, in some measure at least, to the tactical influences of the World War. However, as the war recedes more and more into the past, a return in tactical thought to the principle of mobility is becoming more apparent. This has required modifications in tank design which have not always been compatible with the types of tanks selected as being most useful. It is definitely recognized in some countries that standardization in tanks is desirable but that the types should not be limited to fit the needs of standardization but rather that tactical needs should establish the types of tanks. In the light tank class it would seem that a very light type could fill the place of the light type equally well in practically all features. Not the least of these is economy, an important word these days. It is not intended to convey the meaning that economy is more important than other features but rather that, if the two are capable of compromise, it would seem sound policy to use the cheaper product in larger numbers than a more expensive one in fewer numbers, all other factors remaining approximately equal.

Up to the present, the ultra light tank has been practically ignored in this country, unless we except the one-man tank built by the Ordnance Department several years ago. Since it was primarily a track-testing project, the vehicle was never subjected to any tactical trials. Had this taken place, it is possible that development in the small tank class might have continued as it has in England where the need for small tanks has been more definitely recognized.

THE Carden Loyd armored machine gun carrier, already described in ARMY ORDNANCE, was an open vehicle developed by the well known armament firm of Vickers Armstrongs Limited, for use in the British Army. This vehicle has been assigned to various duties and until light tanks are available in sufficient numbers it simulates these tanks. Numbers of them have been supplied to other countries so that they are now found in half the armies of the world. Most of these little vehicles, in armies other than the British, are furnished with small pyramidal head covers.

In England, practice has kept pace with thought, and, regardless of personal opinion, it must be admitted at least, that ideas in mechanization are given practical trials before being accepted or rejected. The ultralight tank in the British Army appears in a number of roles. The main purpose seems to be as a screen to draw out enemy artillery and antitank fire so that the main attack can be delivered by the medium tanks. There are other uses, such as feint attacks, or even main attacks, and special coöperation with the infantry. In action, the light tanks advance by rushes or bounds, taking advantage of cover as individuals would. Even in relatively open country their small size renders them almost invisible and their speed makes them highly

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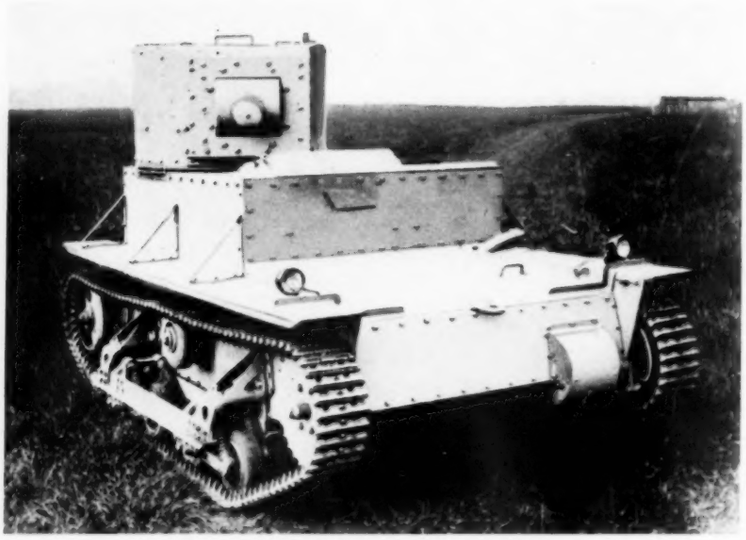
disconcerting to their opponents. The 1931 maneuvers witnessed a further use for these very small tanks as command vehicles for commanders and staffs of armored units, operating in the Napoleonic manner.



The Vickers Carden Loyd Patrol Tank.
The track suspension is of novel design.

THE new British Army light tanks Marks Ia and II weigh about 3½ tons and are about 12 feet in length, and both were developed from the original Carden Loyd types. A still smaller and newer tank is the Vickers Carden Loyd Patrol Tank. The Patrol Tank is but little larger and heavier than the armored machine gun carriers but is faster and more powerful and is, without question the smallest, lightest, and, for its size, the most powerful tank in the world, as well as the cheapest. It has been selected for description since it is an excellent example of the ultra light tank.

The track on this tank has been undergoing constant development and has a life of upwards of 2000 miles. It will be seen from the illustrations that the suspension has been completely redesigned and bears little relation to its prototype. The rear idler is also of completely new design and provides instantaneous adjustment. The steering is accomplished as before by braking the sprocket, the variation in speeds being arranged for by means of the differential. On the right front the driver is located and behind him is the gunner in a turret of 34 inches in diameter, which gives 360° traverse. Entry doors are provided over the driver's head and in the top of the turret. A door for access to the transmission is found on the left forward deck and another is on the top of the hull above the engine. The machine gun is watercooled and in an armored jacket in a standard Vickers light tank gun mount.

The general characteristics of this little tank may be interesting especially since it is so different from any tanks which we have or have under construction. They are as follows: Crew: 2; armament: 1 cal. 303 machine gun and 3500 rounds; armor: 0.276-inch to 0.433-inch, proof against rifle caliber ammunition in front at all ranges; speed: 30 miles an hour; obstacles: slope 25°; turning space: 13 feet; gasoline capacity: 12 gallons; transmission: 4 speeds forward, 1 reverse; length: 8 feet 6 inches; width: 5 feet 9 inches; height: 5 feet 5 inches; weight: 2.2 tons; horsepower per ton: 18; engine horsepower: 40.

ALTHOUGH no development in the ultra light tank class has taken place in the United States, and although mechanized tactical development has advanced cautiously, it is becoming apparent that a distinctly useful sphere exists for vehicles of this type.

The mechanized Cavalry regiment at Fort Knox, Kentucky, consists essentially of three main elements, a covering squadron, a combat car (tank) squadron, and a machine gun troop. The combat cars are the T1 (Christie convertible) and the T2 (formerly T5). The covering squadron of armored cars and combat cars is intended for limited offensive power only and yet the combat cars are the same as those in the combat car squadron which are intended for high offensive power. This would be a very satisfactory place for the very light tank.

In motorized infantry regiments one advantage has been found to be mobility of a high degree, but, on the other hand, these units are vulnerable on the march and difficult to control. When operating in parallel columns there is a distinct need for a fast, small and light cross-country armored vehicle for protective as well as communicating purposes. In advance guard operations, reconnaissance, and for command vehicles in a motorized regiment the ultra light tank would be highly effective.

Another use for the light, small tank is as a command tank in tank or combat car units. The three-tank platoon, which is being advocated for our service, could be handled in much the same manner as the infantry squad is marshalled by its corporal. Since vision and control are difficult, and as radio telegraphy or telephony will always have disadvantages, such personal control has something to commend it. Too, there is the use as command vehicles for the staffs of highly mobile units, mechanized or otherwise.

The principal disadvantages of the ultra light tank are often considered in this country to outweigh the advantages, but the matter should be approached with an open mind. Small size and weight may be less conducive to cross-country ability and stability of gun platform than greater size and weight would be but this is becoming less and less true as development in vehicles takes place. Another type of vehicle violates the principles of standardization in causing procurement difficulties in case of an emergency but this principle should not be dogmatic. A standardized tank will not suit every tactical purpose. The element of economy should be compared to the other conditions in an unprejudiced manner. Six or seven ultra light tanks can be built for the cost of one medium tank. Greater numbers can be made available and tactical development and training are likely to proceed on practical rather than theoretical lines.

All this does not mean that the other types of tanks are doomed to extinction. Each has its place. The very light tank, however, can easily augment and possibly replace the ordinary light types now in use. It has but few disadvantages in comparison with the light type and these will eventually be overcome entirely as development continues.

The Reduction of Armament

I: The Purpose, Organization, Duties and Efficiency of Our Army

By Charles G. Mettler*

I SUPPOSE I am identified in one way or another as belonging to the class of experts, whose access to the supply of the milk of human kindness has been limited greatly. I am sure I am also suspected of having definite instructions and limitations from the Ordnance bureau of the War Department.

As a matter of fact, I am inexpert, sentimental and uninstructed. My bias in any direction will be accounted for solely by an experience of over thirty years in the United States Army during which I have formed definite opinions as to the military measures our country should take at all times with reference to world affairs.

In discussing the reduction of armament, we ought not to proceed with false definitions. I desire therefore to present my definitions. No one can visualize any form of human society without definite rules of behavior enforced by some form of authority. The power by which authority is exercised is always the physical force capable of being exerted by the majority of that society toward offenders against its rules. In order not to divert the majority from its domestic pursuits for the punishment of offenders a smaller number of members are especially trained and armed to represent the majority in the maintenance of order. This number and its arms may be called police armament. This form of armament varies in quantity with the character of the society and the homogeneity of its members.

There are many political societies on this planet, each occupying definite geographical areas, each area differently favored by conditions of soil, minerals, sunshine and rain. In some areas human societies prosper and increase in numbers and wealth. In other areas human societies deteriorate and decay. Prosperous societies are able to acquire higher knowledge of nature's laws and learn to use the less favorable areas for their increasing people. There has been, since the beginning of history, constant conflict between our political societies and there will continue to be such conflicts from these fundamental reasons, if from no other more definite ones. To maintain the existence of any society in the presence of its neighbors, each develops its strength according to some definite plan, and augments this strength by arms. This form of armament may be called national defense armament.

As the human population has increased, practically all the land areas have come under the jurisdiction of the several political societies, but the seas which constitute the greater part of the earth's surface are not yet absorbed into the areas owned by these societies. Among the nations there is an understanding by which definite rules of behavior are required on the seas. To enforce these rules, nations maintain additional force generally in proportion to the interests of their people.

Between the human societies, there have developed certain rules of behavior which are expected to be observed. Disregard of them constitutes an offense against all the population of the earth in its present state of civilization. To enforce these rules, which are increasing through the ages, nations maintain plans for the use of their power. For maintaining order on the seas and between nations, this armed manpower strength may be called international safety armament. The proportion of such armament kept by a nation depends upon its interests in maintaining international order. The present state of world civilization requires each nation to maintain armament for these purposes.

Disarmament in its ultimate stages stands for disorder, distress, disintegration and disaster. Armament in its excessive stages stands for unnecessary waste of the fruits of husbandry, belligerency of government and often wasteful war. There is an intermediate stage, a proper balance, which stands for integration, order and peace. For this stage, our world conferences are definitely striving, and I am hopeful they will some day establish it.

ORDER is said to be the first law of heaven. It is on earth the first law of organized society. Organization of a part of each society into disciplined form to exert force is the basis of authority and order. In examining the efficiency of our own military preparations, or armament, we must determine the likelihood of danger at home and in the far corners of the earth to see that we can meet danger successfully when its bright face looks upon us.

As to the likelihood of war within our own borders, we certainly occupy a remarkably favorable position for security. We have developed on our continent a comfortable existence in comparison with the rest of the world. Our policies are quite naturally directed toward retaining what we have achieved, toward maintaining things as they are, from an international standpoint of peace. What we have done so far in this direction has reduced considerably the likelihood of war.

In spite of our position and our international efforts, we must admit that we live in a dangerous age. Through our loans, our foreign investments, our trade dependencies and world shipping, we have made millions of people of our own nationality, outside our geographical boundaries, dependent upon our activities at home. Their very dependence opens a way to trouble. Our policies are likely to be disputed if we fail to show strength in their support. And also, even in these days of comparative domestic tranquility we cannot ignore our national responsibility for the maintenance of order within and among an increasing number of states with changing populations and sentiments.

THESE definite responsibilities, as well as those indefinite ones that come with the position of leadership among nations, frighten some of our statesmen. They look backward to the good old days of isolation and independence of world thought, with much longing. They would like to withdraw from the Philippines and from Puerto Rico, bring back our observers at Geneva, call in the commercial and

*Part I of an address delivered at the Institute of Politics, Williamstown, Mass., July 29, 1932. Lieut. Col. Chas. G. Mettler is Executive Officer of the New York Ordnance District and was formerly Assistant Military Attaché at the American Embassy, London, England.

military attachés abroad, and lock the front door to keep out this turbulent new world that rises about us. But the new world is here. There is no going back. Each new day brings us closer to our neighbors, compels more of our interest in their business, and more of their interest in ours. A new era is upon us and we must prepare to live in it—whether it bring peace or war.

Furthermore, we cannot ignore the high rate of increase of the world's population in spite of the decimations of war and disease. On this planet there are now almost two billion people, another billion is due before the end of the next century. With all our present complexities of political life, our varieties of language, our differing standards of measurement of time, distance and mass, our wide concepts of religion, there remain many things to be worked out to maintain and establish a peaceful life for these new generations en route to our shores. The reduction of these war-breeding differences should be the major effort of our many societies and international organizations. Perhaps a three billion society will soon be required to coördinate our social efforts toward preparation for the newer and larger world ahead of us.

In our explorations as to the likelihood of war we must not neglect to consult past performances. Our historical records indicate a peculiar cycle of seventeen years between periods of national or international strife. Beginning with King William's war in 1693, there have passed fourteen of these cycles and we are now in the fifteenth, in this year of grace 1932. Only two of these periods have been passed in peace, 1727 and 1829, if we omit the Indian wars of the 1880 period. The historical records of many European states exhibit a singular recurrence of hostilities in the periods of the return of the locusts.

The likelihood of war in Europe and Asia concerns us deeply. If we look at present conditions in the world, few places may be found where the governments are not influenced by fear of neighbors, where some real or imagined conditions could not become today a cause of war. Some say that the great domestic readjustments which have taken place in so many countries are preliminary to an international readjustment, as such events have so often happened one after the other through the ages.

If we harken to the stories told by our visitors returning from abroad, or if we interpret from an international viewpoint the irksome interferences between peoples and nations in the way of trade and travel barriers, we come only to the conclusion that we are now in a period of great international danger.

I WELCOME the opportunity to present an outline of our own military system, to show that we are not failing to assist in the maintenance of order and peace. The United States resulted from a war of eight years with its controlling state, Great Britain. Its final victory and independence were obtained by a small army, irregularly recruited, indifferently armed, but commanded and used by a great general who understood thoroughly the conditions of his problem and the value of his allies. His advice has been the foundation and the support of our military policies. His counsel placed in our Constitution the authority of the Congress to declare war and to raise and support armies, and also designated the President to be the Commander-in-Chief of all the United States forces.

In the days when our Constitution was adopted, every man owned a rifle, and was generally capable of making his own ammunition. The Constitution in its early amendments declared that a well-regulated militia being necessary to the security of a free state, the right to keep and bear arms shall not be infringed. It thus insured that every man could keep, and inferred that he should keep, arms with which he could come to the aid of the country, all prepared for battle. Our military policies for many years assumed that men could spring to arms in a night. In the defense against the Indians and in minor domestic troubles, they did spring to arms and rendered effective service.

International wars, however, required many other weapons than the rifle, and far better organization and discipline than could be obtained in any hastily assembled, self-armed force, as we learned in the War of 1812 with Great Britain. Our many Indian wars soon taught the value of a well trained and well armed force. By the time of the Mexican War in 1845 we had developed a fair military system. During the Civil War, we perfected Army organization and armament in advance of the times. In the War with Spain, we learned new lessons about international war, and these gave us a better army and far better armament. The advent of the World War in Europe indicated that some better method had to be developed whereby the military effectives of the nation could be prepared to support the national policies. In 1916, we enacted into law, what is known as the National Defense Act, consolidating our military system into definite form. From the World War we learned that it was less expensive in the long run to have available and operating a complete plan. In 1920, when we had evaluated the many lessons learned in the greatest international war of all time, we amended this Act to perfect our military doctrines, policies and methods to provide means whereby all the strength of the nation could be assembled and directed to the support of national policies. With the minor corrections made by Congress, this Act established definitely our national military system.

OUR military system is based upon the obligation of all citizens to come to the defense of their country. The military forces of the United States available for defense consist therefore of all the citizens of the nation, male and female, who are able to render military service in any capacity direct or indirect, as combatants or noncombatants. Manifestly, all these people could not be used in the active military forces. No nation can afford to mobilize more troops than it can adequately support in military organization. There is a definite proportion of the population which can be supported and, once we pass this point, we apply the law of diminishing returns. We have before us the example of Russia in the World War, mobilizing nearly 15 million people in the army and, by this mobilization, destroying and consuming the resources of the country to a point of disaster. We therefore contemplate a definite mobilization for our national defense.

The Land Effectives. (a) The Regular Army.—Our military organization contemplates a small Regular Army which is expandable in time of war to 9 infantry divisions, 3 cavalry divisions and some additional units. These units are more than sufficient to form one complete field army. Their total strength on mobilization should be approximately 24,000 officers and 450,000 men. At present, on a peace-time basis, the Congress of the United States has limited this regular force to 12,000 officers and to approximately 118,000 men.

In times of peace the Regular Army, now provided for in appropriations, is used to man the organized Regular Army units and the military offices for the study of war doctrines, for national police, for the protection of foreign possessions, for the instruction of the supplementary elements, and for many national purposes. The studies which were made by the best military experts of the country between 1920 and 1922 indicate that the United States requires on a peace footing for certain definitely indicated tasks the following numbers of officers and enlisted men:

Continental United States—3584 officers, 80,022 men. This force is intended mainly for police power, resistance to invasion and the study of war methods. It is scattered over the continent at convenient places for the maintenance of order. Every president has used some of this force to reestablish order in some part or parts of the country. The larger groups experiment with tactical methods.

Panama—703 officers, 13,778 men. The Isthmian Canal provides a short route between the Atlantic and the Pacific oceans for the naval forces and materially reduces the number of vessels required for our two-ocean protection. Its safety is of the greatest importance. We also have responsibilities to the world's commerce in preventing seizure of the Canal by any foreign power.

Hawaii—980 officers, 19,427 men. This force is intended to guarantee a naval base at Pearl Harbor for the Pacific fleet, some 2100 miles off our western coasts. This base is a police station in the midst of the world's greatest water area, enforcing international rules of conduct over the long sea lanes, as well as preventing the passage of foreign hostile fleets to the Pacific littoral and the Panama Canal.

Philippines—638 officers, 4,211 men. This force is intended to protect the naval base at Cavite, Manila Bay, for our police squadron in far Eastern waters, and to support the Philippine forces in the maintenance of order in the widely separated land areas of the Philippine Islands.

China—57 officers, 1135 men. Under international agreements, resulting from the coöperative work of the nations during the Boxer Rebellion in China, we have undertaken definite guarantees in respect of collections of funds and maintenance of order in certain Chinese areas.

Puerto Rico—63 officers, 1593 men. The Puerto Rico forces were organized to support the new government in this island and to assist the United States in the maintenance of order in Caribbean areas. These forces are now an integral part of the Army of the United States and assist in the guarantee of an outpost for the protection of our Isthmian Canal.

Alaska—19 officers, 596 men. The Alaskan territory is an enormous area, thinly populated, having great natural resources in minerals and fisheries. Unusual conditions arise from the gold rushes, the development of new enterprises, the protection of the natives, the maintenance of order among seal and salmon-fishing interests and the proximity to Asiatic nations, requiring the assistance and the salutary presence of government power of enforcement.

Schools—1985 officers, 12,262 men. These troops form the instruction units with which officers are trained in the science of infantry, cavalry, artillery, tank, gas protection, and the many varieties of military organizations. Here the doctrine is standardized for all the National Guard and Reserve organizations as well as the Regular troops and officer instructors are trained for all the duties of military organization.

Coast Defense—733 officers, 10,933 men. These troops maintain in working order the heavy artillery provided in seacoast fortifications for the protection of the many important harbors of our long coast lines. Their presence prevents the seizure of critical centers of commerce and allows the naval forces to remain concentrated for effective sea duty.

National Guard—732 officers, 800 men. These officers and men care for the instruction of National Guard units to insure proper coördination with the other forces of the nation.

Organized Reserves—756 officers, 1200 men. These forces provide instruction in standard doctrine for the organized reserve forces throughout the nation.

Reserve Officers Training Corps—756 officers, 1200 men. The supply of officers to the organized reserves mainly comes from the training units in the schools, colleges and universities of the nation. Young officers, familiar with the reserve plans and the duties of officials in military work form the backbone of this splendid and inexpensive organization through which the greatest number of our effectives are provided.

Overhead Administration and Staff Study—3301 officers, 15,147 men. These forces include all the officers required on the General Staff, Corps Area staffs, War Department bureaus, and the many overhead requirements essential for the operation of the whole military system of the United States, scattered in all parts of the world, as well as the perfection of the war mobilization plans for the effectives and for the supplies of armament and equipment.

THE grand total of these requirements amounts to 14,267 officers and 162,004 men, certainly a modest force for the insurance of a nation of 120 million people, holding 3 million square miles of the earth's surface, with a national wealth of nearly 500 billions of dollars. That the work above described is now carried on by 12,000 officers and 118,000 men in an effective manner, indicates the high efficiency of the personnel.

To provide additional officers and men for all other incidental functions and for the semimilitary and nonmilitary activities not provided for in the above distribution, Congress fixed the normal strength of the United States Regular Army in the National Defense Act at 18,000 officers and 280,000 men.

The contributions to the nation by its military organizations and their officers outside their direct functions in the way of national and international safety have been considerable. Such contributions are required and in some measure provided for by the Congress. They include: (1) The development and maintenance of the channels of our rivers and harbors. (2) The construction and supervision of the Panama Canal. (3) The operation of transportation lines on inland waterways. (4) The construction and supervision of Alaskan railway telegraph and cable lines, and in former times, much of the engineering and guard work in connection with the building of the trans-continental railways. (5) Much of the police and development work in the national parks during past decades. The maintenance and improvement of national monuments and national cemeteries. (6) The control and assistance of afflicted areas in times of flood, earthquake and national calamities. (7) The establishment of order, the development and training of police forces in new possessions and in disrupted American States. In some cases, the operation of government until

suitable civil government could be restored. (8) The operation of relief missions in Europe and Asia after the World War. (9) The handling of special matters—domestic, foreign and international—for the national government. In these extra-military tasks, the American Army has rendered and is giving constantly service of inestimable national value.

As the principal source of supply for trained regular officers, the United States Military Academy is maintained at West Point, N. Y., at a strength of about 1300 cadets, supplying each year somewhat over 200 young officers. Additional requirements are supplied from the ranks of the Army and from civil life.

(b) The National Guard.—The National Guard of the United States which is the organized militia of the states mentioned in the Constitution, is provided and officered by the several states of the union and is employable by these states for the maintenance of local security. It is at all times subject to call to the service of the United States and is supervised by the United States government to such an extent as to require organization and training in accordance with the national doctrine. This force is expandable to 18 infantry divisions and 4 cavalry divisions, which may be organized with certain units from the other components to form two field armies. The maximum strength of the National Guard when fully mobilized is intended to be approximately 24,000 officers and 480,000 men.

(c) The Organized Reserves.—The Organized Reserves constitute a frame work or a skeleton upon which additional manpower of the nation may be hung to develop further strength when it is needed. These Reserve organizations are expected to provide for 27 infantry divisions and 6 cavalry divisions, when fully mobilized, and other military units.

A part of them are expected to be organized into three reserve field armies. The remainder supplies other field armies and headquarters with appropriate units. Their total maximum strength on mobilization will be approximately 106,000 officers and 2 million men.

In the studies of national defense by the military experts, the following essential peace time numbers were established for the National Guard and the Organized Reserves, to provide for war expansion:

The National Guard... 16,324 officers and 250,000 men
The Organized Reserves 80,182 officers and 125,000 men

These numbers are not attained under normal peace conditions. These studies indicated for the supply of the Organized Reserves with officers, that the Reserve Officers' Training Corps should train about 120,000 students and the Citizens' Military Training Camps each year should train approximately 50,000 students.

(d) Total Organized Forces.—Considering all sources our organized mobilization may reach if required the following amounts, the total effectives so organized as to make six field armies: one principally from the Regular Army; two principally from the National Guard and three from the Organized Reserves.

Regular Army	24,000 officers....	450,000 men
National Guard	24,000 officers....	480,000 men
Organized Reserves.	106,000 officers....	2,000,000 men
Grand Total of	154,000 officers....	2,930,000 men

In addition, the Marine Corps of the Navy in part becomes available for the land operations of the Army in time of war. In case the emergency should require a greater number of effectives, plans are made for additional mobilization up to the full power of the country to supply and maintain its armies.

Thus are the total effectives of the nation brought into one form of organization, under one supreme command, and into a single united effort to enforce the will of our people. The Regulars available at home, form the first resistance to invasion; the National Guard reinforces the Regulars as soon as it is mobilized and concentrated; the Organized Reserves are thus given time to complete their units, to mobilize and to train for participation in the national defense in the amount required.

TO provide in times of peace for the orderly assembly of our effectives in war, the land area of the United States is divided into nine corps areas, on the basis of military population, each intended to supply in a major effort a complete army corps. Each corps area contains at least one division of the National Guard, one or more of Organized Reserves and such other troops as may be assigned. The corps area commanders control all forces in military establishments within their territorial limits except a few exempted ones. They are responsible for the development, organization, training, supply and inspection of the National Guard and the Organized Reserves, and for keeping in order the plans for mobilization.

In passing from peace to war, organizations of the Regular Army and National Guard are normally increased to war strength by voluntary enlistments in their corps areas. The Organized Reserves are brought into service, if necessary, by application of selective service laws. It will be seen that selective service will apply when a major mobilization is required by the national emergency, but need not apply for lesser troubles.

Under this general plan the national effectives can be drawn either ten thousand, a hundred thousand, five hundred thousand, a million, three million, or as many as the particular emergency may require.

Thus I hope I have made clear the operation of our military laws, by which we may assemble all the military effectives and prepare them for any national military effort.

IT will be evident at once that the act of assembling three million selected men, or even a part of them, physically and mentally sound, of proper age, least essential to the functioning of local, state and national government, least required for the supply of the nation at home, and the enormous supply services of war, is a task which requires considerable preparation to avoid confusion and futility. Each man must be under definite direction, must arrive at a definite place at a stated time, must be uniformed, armed, housed, fed and kept from disease infection. He must then become familiar with the tools he will use, must learn to use them at proper times, in a most effective manner, and must coördinate his effort with that of his fellow soldiers to secure maximum maneuver and battle efficiency. Otherwise he will waste the national resources without returning proper value to the nation.

Accordingly, the organization is perfected, the places of assembly selected, the requirements of clothing, arms, and supplies are apportioned and all details completed as far as

practicable in advance. Each year selected parts of the several army components are taught, in schools, camps and maneuver grounds, as far as funds will allow, the established methods of mobilization, discipline, maneuver and battle technique. By careful selection of troops, officers and key men over a period of years, the War Department secures sufficient rotation to establish a fair amount of preparation throughout its military establishment. The more preparation made in peace, the less confusion and inefficiency occurs in war.

I HAVE tried to make clear that the present military plan resulting from long experience, and from the greatest war laboratory ever organized, the World War, appears to be capable of bringing to the aid of the nation with the greatest simplicity any or all the military effectives that our population can furnish and support, and also of bringing them with sufficient preliminary knowledge to develop at an early stage, the coördination of action and the use of war tools sufficiently to defend and support the nation. The scheme is sufficiently flexible that Congress may raise and lower the amount of defense insurance in accord with the times within certain limits. It has lowered the number of Regulars and decreased the amount of training without change in the system during the past ten years.

The last Congress argued at great length the question of reducing the Regular Officer strength by one-sixth, or a reduction of 2,000 officers. It also brought up the question of the abolition of summer training of the Organized Reserves, of certain units of the Reserve Officer Training Corps and of the Civilian Military Training Camps. All phases of defense were examined from the standpoint of economy of government.

The Senate, our guardian of foreign relations, fully cognizant of the state of the nation and of world affairs, refused to countenance any reduction in our military plan, even in the face of treasury deficits of appalling amounts. It was held that our national insurance was the lowest that ought to be carried and that it would be bad policy to save from this course for any temporary condition of the national treasury.

The group of Regular Officers and the corps of civilian employees in charge of the operation of our military system is approximately adequate to keep its many phases in working order, but is in no wise excessive. If higher efficiency than is now obtained is to be established, these forces are insufficient. My own observation assures me that no better system has been devised by any other nation, nor has one obtained such possibilities of united national strength at so little proportional expense. The present efficiency of the system is high and will remain so, if it retains the support from the nation that is now given.

I shall have an opportunity later to present the matter of the supply of arms from the national stocks and from the industries of the nation.

A STUDY of history from the beginning of the records has indicated to us the changing attitude of the world's people. What one generation has declared to be sacred and unchangeable, and whose declaration has been celebrated with pomp and ceremony, we have seen succeeding generations ignore and denounce. We are warned by many examples through the ages that neglect of defensive power has led to diminishing boundaries, loss of respect in the world's councils, and so often to absorption, loss of identity, or complete dissolution as an economic or political entity. In spite of all treaties, alliances and promises, it behooves every nation that desires to continue as a free and sovereign state, to prepare itself to exert its national power in case of necessity. Our Constitution and our laws provide for this. This is our general need for armament.

Our own history indicates changing policies since the Constitution was written. Like so many of the world's states we were created by war. Our early policies required expansion to defendable boundaries. These policies were carried out through wars with England, Mexico and Spain, and by purchases from France, Spain, Russia, Mexico, Denmark and Panama. To eliminate neighborhood difficulties, we annexed Hawaii and Puerto Rico, and announced to the world repeatedly that we would look with disfavor upon any expansion of foreign influence in the Americas.

WE are now apparently fairly well satisfied with the extent of our domain and the control we have obtained over our vicinity. Our present policies indicate that we intend to retain our form of government, our land areas, our influence in the Americas, and our international position. To maintain these policies we have definite needs for armament.

In addition we have assumed control of the Panama Canal Zone and opened the Panama Canal to the world shipping, under definite policies. We have arranged policies with reference to the fishing areas in the Atlantic and Pacific near our borders. We have fought Barbary pirates in the Mediterranean and have indicated our policies in respect of the safety and the freedom of the high seas. We fought the Boxer Rebellion in China, have maintained troops there to enforce compliance with treaties, and to insure safety to our legation. We have announced policies with reference to the open door for trade in that country. We have recently sent troops to Shanghai to protect our nationals and their property.

We interfered in the World War very decisively and, at its conclusion, kept our troops in Germany for some years to insure peace. Our actions at that time were largely responsible for present European boundaries under the principle of self-determination and for the initiation of the League of Nations at Geneva. Due largely to that war we have emerged from the position of debtor to that of creditor to many nations of the earth and we are formulating policies bearing on the payments we are to receive.

Not infrequently, we have interfered to correct disorder in the Caribbean and Central American States and we have a definite responsibility for order in the Cuban Republic.

These things are the national policies, for whose maintenance the military plan is developed.

To maintain this union of states, to insure domestic tranquility therein, to support the policies and commitments which are cited above, and to present to the world a solid and well defended position on any international issue, I am firmly convinced that we need to maintain all the provisions of our National Defense Act. It is a great support to our statesmen in international councils and our greatest guarantee of continued peace. Should it be demonstrated clearly at any time that the military plan is either inadequately or excessively manned or either overstressed or underestimated in accordance with the national needs, I am sure the national Congress and the War Department would be prompt enough in applying the necessary and proper corrections.

(Part II will be published in the next issue of this Journal.)

Ordnance Troops at the Panama Canal

Training the Soldier-Specialist for Combat and Supply

By Walter G. Donald*

FOREWORD: In writing an introduction to an article on the Ordnance Personnel at the Panama Pacific General Depot it is necessary to cover briefly the garrison at Corozal as a whole, its duties and the necessity for service troops being used as reserve combat troops.

The Panama Canal Department is very fortunate in having a commanding general, Maj. Gen. Preston Brown, who believes the duty of a Regular Army soldier is to be a soldier first and a specialist afterwards, as our Regular Army is so small all may be called for combat duty at the outbreak of hostilities, particularly in our foreign garrisons. In addition it has been shown that military training increases efficiency in all lines.

With the above in view all recruits received at Corozal are put through recruit training over a period of six weeks in the basic instruction of an Infantry soldier. This, regardless of whether they are assigned to Engineers, Signal Corps, Chemical Warfare, Ordnance, Bakery Company, the various branches of Quartermaster Corps, Medical Corps or Veterinary Corps.

To continue this training after joining their organizations the services (Engineers have their own regular organization and training) have been grouped into the 1st Depot Regiment, Panama Pacific General Depot at present under command of Lieut. Col. Charles T. Harris, Jr., Ordnance Department (in command of the Ordnance Section of the Depot). The Regimental Commander prescribes the days and hours for training as combat units limiting this training to two half days per week, the balance of the time being given to their regular supply and section service functions. While some believed, at first, that combat training would interfere with their normal duties, the reverse has been found to obtain. Their service duties are done promptly and efficiently and now these men have the carriage, the dress, and in general the appearance of the highest type of regular soldiers. They do guard duty, have regular outguard positions assigned to protect the Depot and Post of Corozal, and thus relieve the Engineers for duty away from the post proper when the emergency arises.

The details of the duties of the Ordnance Section are described in full in the following article and I can only add that as commanding officer, in garrison or in the field, in peace or war, I am proud to have such troops under me as the Ordnance Troops of the Panama Pacific General Depot.

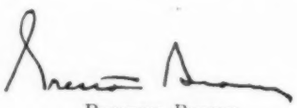
G. Williams,
Colonel, Cavalry,
Commanding Panama Pacific General Depot and the Post of Corozal.

IN July, 1921, the Panama Canal Division came into being and with it the 10th Ordnance Company (Maintenance), the first organized Ordnance Company in the Panama Canal Department. Since that time there has been added the 2nd Platoon of the 72nd Ordnance Company (Depot), the 20th Ordnance Company (Maintenance), and the Detachment Ordnance, Panama Canal Department. All these comprise the present strength of Ordnance personnel in the department, a total

*Commanding Composite Ordnance Company, Corozal, C. Z. 2nd Lieutenant, Ordnance Department, U. S. Army.

MANY years ago a King of Spain, surrounded by his court, sat in his chair before an ever-increasing open fire in the palace hall. He was in great discomfort. Etiquette-bound grandees, who formed the "set up" and "table of organization" for the Royal Court, could not find the "specialist grandee" whose sole duty and privilege it was to move the kingly arm chair to a more comfortable position. His Majesty, bound by tradition, remained in place, and died as a result of the exposure—a victim of too much organization.

The Regular Army of the United States is necessarily and properly small. It is our country's citadel of military tradition and training. I hold that every officer and soldier should be fitted for front line command and duty before all else. After that, specialist training. Each and everyone of us should be able and ready to move Uncle Sam's chair. The Ordnance troops of this Department can do it, and I am very proud of them.

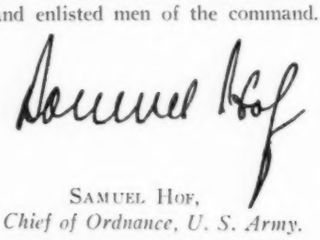


Preston Brown,
Major General, U. S. Army,
Commanding Panama Canal Department.

THE Ordnance Department exists to serve the Army. If it is satisfactorily to accomplish its mission of providing and maintaining the Ordnance matériel required by the using arms and services, it is essential that its military personnel and organizations be fully trained.

The Ordnance Officer must be, first of all, an Army Officer, with adequate basic military training. Normally he is selected for Ordnance service only after he has served in a combat arm. Similarly the Ordnance enlisted man must be first a soldier, with proper discipline and thorough understanding of his military responsibilities and privileges. Upon this sound military foundation, there can be added specialized Ordnance training and instruction, and the individuals welded into an effective organization.

The degree of military and professional efficiency attained by Ordnance troops in the Panama Canal Department, the high standards set, and their achievement, reflect great credit on the officers and enlisted men of the command.



Samuel Hof,
Major General, Chief of Ordnance, U. S. Army.

of approximately 120 men. Of these, all are stationed at the Ordnance Section, Panama Pacific General Depot, Post of Corozal, with the exception of the 20th Company. The latter has its headquarters at the Ordnance Section but its members are situated at various posts on the Isthmus, to carry on the repair and maintenance of outlying stations. Though the 20th Company accomplishes the same valuable work and is of equal importance in the scheme of Ordnance operations, this article will deal chiefly with the troops of the home station since it is there that they function as one unit.

The training of Ordnance men in the Panama Canal Department is directed along two lines, (1) training in maintenance and supply, and (2) training in combat and the military duties of the soldier. Each is of equal importance and each has its place in the training program. It is expected that every man will not only be proficient in Ordnance specialist duties but also that he be instructed in, and capable of performing, the duties of a soldier of the line. This is in accordance with the policy of the Commanding General of the Department and is also in agreement with the recently published policy of the Chief of Ordnance which states that, "Despite the fact that enlisted men of the Ordnance Department are chiefly engaged in maintenance and supply activities, they are nevertheless soldiers of the Regular Army. Military training and discipline are not only essential to these men to qualify them as soldiers, but are also beneficial to their Ordnance work." The fulfilment of these policies is the aim of all Ordnance training in the Panama Canal Department. Four full days, from 7:00 A. M. to 3:30 P. M., are devoted to the maintenance and supply duties, and two half-days are spent in military instruction. Wednesday and Saturday afternoons and Sundays are holidays.

THERE are, with few exceptions, adequate facilities in the 10th Company shops for the repair and maintenance of all small arms, mobile artillery, motor vehicles, and tractors in the Department. It is not intended that any manufacturing be done in the Department, but in certain instances where production work has been necessary it has been found that the shops have satisfactorily met any reasonable manufacturing requirements.

During the past year the automotive section of the company has successfully finished the man-size job of completely overhauling nineteen 10-ton tractors and twenty-eight 5-ton tractors in addition to keeping in first class running condition twelve F.W.D. trucks, five G.M.C. trucks, and four 6-ton tanks. All skilled labor used in this work was furnished by enlisted personnel.

In overhauling the tractors every one of them was taken down to the point where a thorough inspection could be made of all parts. After cleaning, replacements and repairs were made wherever necessary. Before each tractor was turned out of the shop it had undergone a complete motor overhaul, and had received a new coat of paint throughout. Every tractor, after the completion of the overhaul, was subjected to a stiff power test and then blocked-up in the tractor storehouse. Here, once each month, all tractors are tested to insure their delivering reliable performance when issued, and to exercise all moving parts such as tracks, clutches and motors.

The small arms shop executes all maintenance work in connection with caliber .22 and caliber .30 shoulder rifles, automatic rifles, machine guns and 37-mm. guns pertaining to the peace-strength garrison of the Panama Canal Department, a total of approximately 9,500 officers and men. Since there is but one "A" course rifle range on each side of the Isthmus each range is continually in use a great part of the training year and, consequently, a continuous minor repair program is necessary. A small arms truck with detail is on duty at each range whenever firing is in progress. All small arms modifications are made in the shop, and besides this the armory section furnishes the armament officer his working staff in the annual inspection of small arms in the Department.

AT present the machine and artillery repair shop is in the midst of an inspection of all 3-inch and 75-mm. pieces stored at the depot, ascertaining their serviceability preparatory to their being re-warehoused. At the same time, directed modifications are being made on the guns. A series of tests were recently made of different designs of antiaircraft machine gun mounts to be permanently placed at selected points in the Canal Zone. These mounts were manufactured in the machine shop. Besides the usual Ordnance modification work orders executed, all the work concerning the proper maintenance and inspection of property in the storehouses of the section is handled in the machine shop.

The leather, carpenter, and electric shops though smaller than the others, are adequately equipped to take care of all repair needs in their line. Leather, in the Panama Canal Zone, needs very careful attention. Without care it may either become mildewed, or it may dry out and crack. It is evident from the comparatively little leather repair work called for by the using branches that they take good care of the leather issued to them by the Ordnance. The carpenter and electric shops are, of course, a necessary service function of the section and are well equipped to operate as such.

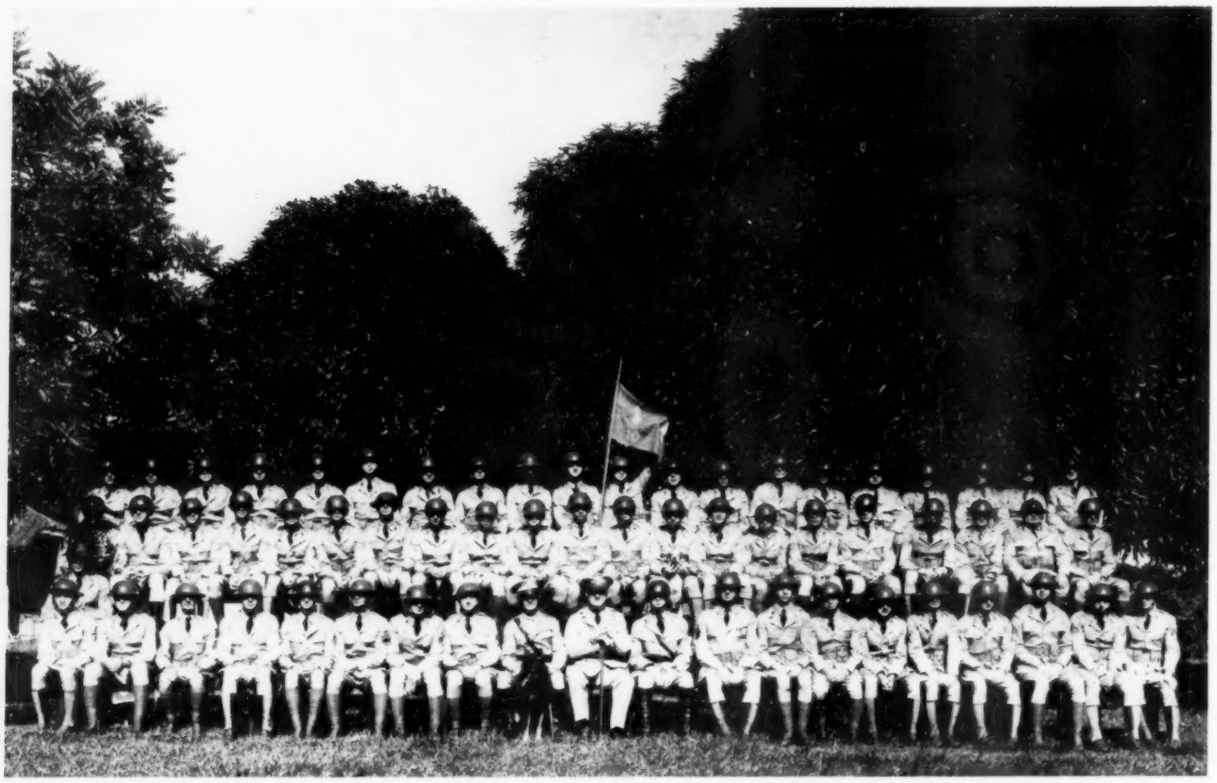
On the 2nd Platoon of the 72nd Ordnance Company rests the task of storage and supply. In the Ordnance Section members of this company handle the storage and issue of Ordnance material in groups pertaining to 6-ton tanks, 5-ton and 10-ton tractors, 155-mm. guns, seacoast gun matériel, all target material and all hardware. Much time has been spent in the past few years on the installation of new racks and shelving, always working towards a fixed plan of a better classified and a more simplified arrangement of stores.

Besides the storehouse detail, two men, a sergeant and a private first class, from the 72nd Company, are at the Cerro Tigre Ordnance Depot, a distance of nine miles from the Ordnance Section, in the capacity of a care-taking detail for ten ammunition magazines situated there. Concentrated in these magazines are the main ammunition stores of the Department, kept under conditions which, for this country, are considered ideal.

The foregoing gives a general idea of the amount of maintenance and repair work accomplished and shows that it in no way suffers because of the fact that drill is given such an important place in the training schedule. Having considered briefly the maintenance activities of the Section, let us now focus our attention on the method by which the organization works towards qualifying as a reserve combat unit, with every officer and enlisted man available for immediate combat duty.

The week is divided generally into working days and drill days, four days a week being designated as working

With the Ordnance Troops in Panama



The Composite Ordnance Company, in the Ordnance Section, Panama Pacific General Depot, Corozal, C. Z.

In the first row center are seated Col. G. Williams, Cav., Commanding Officer, Panama Pacific General Depot and the Post of Corozal; Lieut. Col. C. T. Harris, Jr., Ord. Dept., Department Ordnance Officer, and 2nd Lieut. Walter G. Donald, Ord. Dept., Commanding Composite Ordnance Company, Corozal.

Tanks of the 10th Ordnance Company, Post of Corozal

When the "Rally" alarm is sounded speed is the prime essential. While units of the company hurry to magazine areas and patrols and outposts take station, these tanks ready on their trailers are lined-up to await orders. Quick action in the defense of the Canal is the result of these practices.

days, and two half days, Wednesday and Saturday mornings, being set aside as drill days. These two mornings are devoted to strictly military training, and then it is that the specialist trained in maintenance becomes the soldier trained in combat. To accomplish this a comprehensive drill program is planned and executed. The Wednesday drill morning is, as a rule, spent in this way—a half hour period of calisthenics precedes close order drill which lasts at least three-quarters of an hour, and this in turn is followed by a period of timely military training such as interior guard duty, marksmanship, extended order drill, lectures on military subjects, or else by a drill period devoted to tanks and repair trucks. Saturday is principally devoted to inspection, though the usual period of drill follows inspection, and any remaining time is spent in miscellaneous military instruction.

PERHAPS a detailed description of a typical Wednesday would make things more clear. Of course, it is understood that week in and week out the points emphasized in drill on both days vary because of the effort made to have each man proficient in all movements. It may also be well to explain here what is meant by "company" in this article when it is mentioned in reference to drill. Our organization for military training is such that the 10th Company, the one platoon of the 72nd Company, and the Detachment Ordnance, are combined to form one Provisional Ordnance Company. In addition to training the man in ranks so that he will be proficient in all movements, every possible chance is given the non-commissioned officer to gain experience in as many capacities as possible. Every enlisted man in the Ordnance Section drills whether he be master sergeant or private and must fill, in a proficient manner, the dual role of being a combat soldier as well as a specialist in maintenance or supply. For example, the chief clerk in the main office, a technical sergeant, is a platoon leader on drill days as is the superintendent of shops, also a technical sergeant. The chief of the automotive section, a sergeant, is a guide and section leader.

On Wednesday mornings, after a half hour of calisthenics, the company is formed for close order drill at 7:40. Drill is carried out according to Infantry Drill Regulations, special emphasis being placed on training in leadership and command. Following this idea the corporals and acting corporals are required to drill their assigned squads in all squad movements; the sergeants are instructed and trained as section leaders and platoon guides; and the first three grade men assume the duties of platoon leaders both in platoon drill and company drill.

With one officer to a company as authorized by peace strength tables of organization it is imperative that the "chain of command" policy be continually stressed. The first three grade men are detailed as platoon leaders, in turn, for a period of approximately two months. During that time they are responsible to the company commander for the appearance, drill and discipline of their platoons. Though only two men are definitely assigned as platoon leaders for each two months, during that period all other first three grade men are required to drill platoons at different times, so that all may have the required training and experience in giving commands. When a first three grade man becomes particularly proficient as a platoon leader, he is sometimes given the opportunity to drill the entire company, thereby gaining further experience and in turn more confidence in himself. The sergeants in turn are responsible to the platoon leaders for their sections. Their position is particularly important in barracks due to the fact that the first three grade men live in separate quarters and, consequently, part of their responsibility as platton leaders shifts to the fourth grade sergeants who live in barracks with the men and are in closer contact with them. At close order drill the sergeants are required to be able to command a platoon if called upon to step out of their usual positions as platoon guides or section leaders. The final and most important link in the chain of command is the corporal or acting corporal upon whom rests the direct responsibility of getting across to the man in ranks, through instruction, example and contact, the whole aim of military training. They must know and be able to instruct men of their squads in the fundamentals of drill and the requirements of good soldiering.

THE close order drill period ends at 8:30 A. M. and the rest of the morning is spent in such training as the time of year indicates. For instance, at the present time the company is in the preliminary stages of marksmanship. First three grade men, with a sergeant or corporal to assist them, are designated as instructors in one particular phase of the preliminary exercises. The men required to fire are divided into groups. The instructors then take one group each drill day and teach that group one phase of marksmanship. The groups rotate from day to day and in this manner receive instruction from men properly prepared to give it.

One Wednesday each month is designated for the testing of trucks and truck equipment, and at the same time the four tanks assigned to the 10th Company are manned and tested. At least once every three months the "Rally" alarm is sounded, at which time all troops take the position assigned to them in case of an emergency call in the Panama Canal Department. At this alarm, speed is the prime essential—the four 6-ton tanks, ready on their trailers, are withdrawn by trucks from the shed and lined up to await orders; a platoon of three squads, armed with rifles and two machine guns, is on its way by truck to defend the magazine area at Cerro Tigre, nine miles away; patrols and outposts are assigned and manned along the limits of the Ordnance Section—all within a space of fifteen minutes. Quick action is demanded in Department emergencies and quick action is the result of these practice periods.

Saturday morning's schedule consists of inspection of barracks, inspection under arms in ranks, a period of close order drill, and a short period continuing the Wednesday morning work or a conference of the non-commissioned officers with the company commander.

Inspection of barracks in the Panama Canal Department is primarily for cleanliness, although a high standard is maintained in orderliness and appearance. We are fortunate in the Ordnance Section in having excellent housing facilities as an aid in living up to the required standards. The main barracks is of concrete, two stories high, with large screened windows on all sides, and with no partitions whatever in the upstairs squad room and a minimum of partitions on the lower floor merely to separate a squad room, day room, mess hall and kitchen. This type of building allows excellent ventilation, a much needed condition in Panama. In addition to the large concrete barracks there is a frame building which contains the squad room of the 72nd Company. This is likewise open on all sides and equally comfortable. To

further insure ventilation in both buildings, all beds have been raised by inserting unserviceable rifle barrels in the legs, in place of the wooden casters, and in turn inserting the casters in the barrels. This raises the beds approximately fifteen inches higher above the floor. On the foot of the beds steel racks have been attached which hold the men's foot lockers and shoes. This clears the floor of all equipment and permits a proper circulation of the lower air from one end of the building to the other. At the same time it improves the appearance of the squad room because of the unobstructed floor space and the resulting uniform arrangement of equipment made possible by the racks.

INSPECTION under arms in ranks involves the usual checking-up on details making for neater personal appearance and care of equipment. It is unnecessary to mention that cleanliness of uniforms is important as that is so wherever a soldier may be. But probably nowhere is there as much reason for paying as strict attention to metal and leather as in the Panama Canal Department (or any tropical station)—and rightfully so. The climatic conditions of Panama are such that brass tarnishes quickly, metal rusts rapidly, and leather unless properly cared for either dries out or mildews. Special attention in inspections must therefore be paid to the condition of all metal or leather equipment. Whether brass is polished or not makes or mars a soldier's appearance, and that is important enough, but a rifle or pistol that is not properly cleaned and oiled not only marks the man as an indifferent soldier but means that with few such occurrences the man will no doubt buy himself a new barrel or other part. Leather without care disintegrates rapidly but with proper saddle soaping, a little neat's-foot oil now and then, and shining with lotion cream rather than a wax paste, an ordinary amount of wear may be expected from all leather equipment. Although the good soldier knows that a little work done frequently is best for his equipment, thorough inspections once each week insure the fact that he, as well as the less earnest soldier, will, by care of his equipment, both increase its serviceability and add to the general smart appearance of the company. Having already referred to close order drill and military training on our other drill day it will suffice here to say that the same general method is followed on Saturday as on Wednesday.

In addition to the regular drills the companies attend all Post of Corozal, Panama Pacific Sector, and Panama Canal Department reviews and parades, at which they are designated as Company A of the Provisional Regiment, Panama General Depot.

In the foregoing paragraphs an attempt has been made to convey an idea of the methods by which one Supply Department organization in the Canal Zone has proceeded in order to insure proficiency in the specialist duties for which the organization was provided, to attain by its training and appearance a qualification as a first class reserve combat unit, and to be considered a competent element of the United States Army.

Discussion

THE photographs shown with Lieutenant Donald's article are of a composite Ordnance Company in the Ordnance Section, Panama Pacific General Depot, Corozal, C. Z. This company is made up of the 10th Ordnance Company (Maintenance), a platoon of the 72nd Ordnance Company (Depot) and the Ordnance Detachment at Large, Panama Canal Department.

The Commanding General of the Panama Canal Department, in his training, has continually stressed the requirement that troops of the supply departments shall compare favorably with troops of the line in appearance, condition of equipment, close-order drill and ceremonies. He has further emphasized that every supply department organization shall qualify as a reserve combat unit. The Chief of Ordnance has stressed, among his published policies for training Ordnance Companies, that all Ordnance Companies shall be given military training including close-order drill and training with the rifle. The daily work of the Ordnance troops stresses the need for efficient specialist training in maintenance and supply.

To indicate that the Ordnance troops qualify in appearance and in military training, the two photographs on page 96 are offered as evidence. That the Ordnance troops qualify as a reserve combat unit is indicated by the fact that the Ordnance units man and maintain four 6-ton tanks, that a platoon of three squads guards the Cerro Tigre Ammunition Depot upon emergency call, and that interior guards are provided for the Ordnance Section of the Depot. That the troops are qualified as specialists in maintenance and supply is amply demonstrated by the work performed during the past year.

The accompanying article was prepared by Lieutenant Donald, who commands the Ordnance Company. Under his efficient guidance the training of the Ordnance units has been brought to a satisfactory point. In the work of training in maintenance and military duties, Lieutenant Donald has had the assistance of some very excellent technical and staff sergeants: including, Technical Sergeant Lonnie B. Williams, Ord. Dept., as platoon leader and chief clerk of the Ordnance Section; Technical Sergeant John A. Ramsey, Ord. Dept., as platoon leader and in charge of Property Records; Technical Sergeant Aubrey Alvis, Ord. Dept., as platoon leader and foreman of the Tractor and Small Arms Shops; and Staff Sergeant James J. Gallagher, Ord. Dept., as platoon leader and assistant in Shop Office. Others have given excellent services but these men have been outstanding.

In all training activities the Ordnance Section has received the full support of the Commanding Officer of the Panama Pacific General Depot, Col. George Williams, Cavalry, and has been encouraged by the friendly interest of the Department Commander, Maj. Gen. Preston Brown, U. S. Army.

C. T. Harris, Jr.,
Lieut. Col., Ordnance Department,
Department Ordnance Officer.

Editor's Note: The Adjutant General of the Army has recently sent to all Corps Areas a letter on military instruction of Ordnance companies. This communication will establish for all Ordnance troops the policies already in effect in the Panama Canal Department as described above. The directive states that all Ordnance troops will be equipped with the rifle and qualified in target practice, the manual of arms and close order drill. Each company will make an annual practice march or participate in the field exercises of troops to which it is assigned. In addition to the minimum training and instructions specified more extensive training may be prescribed by the commander under whom the organization may be serving.

Piezo-Electric Shotgun Pressures

An Advantageous Method for Recording Measurements

By C. T. Ervin*

THE hardy back-woodsman with his long Kentucky rifle was not concerned about the pressures developed in his firearm. The maker, however, was concerned to the extent of giving the rifle a proof test by an over-load charge. At that time this represented the last word in safety regarding the unknown pressure within gun barrels. When the percussion arm came into existence there was much concern in some quarters about pressures. Indeed, was it not necessary to vent the gun at the chamber to relieve the vacuum, lest the tremendous air pressure collapse the barrel?

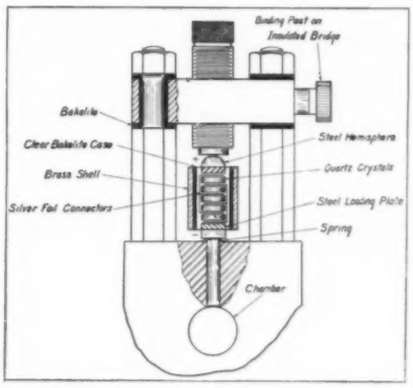


Fig. 1. Installation of the Piezo-electric Pressure Gage for Measuring Chamber Pressures in Shotguns.

Arms have changed since then. The methods used in the investigation of arms have changed. Our understanding of the conditions existing when an arm is fired has constantly increased. The barrel thickness of guns has decreased, better steels are used, and pressures have increased. In the past few years scientific research has perfected apparatus suitable for recording the pressure variations in guns. This apparatus fills a long recognized need of the ammunition manufacturer. In the past it has been necessary to rely on lead crusher cylinders to give an indication of the maximum pressure developed in shotguns. This method obviously does not give any indication of the rate at which the pressure builds up or the rate at which it decreases. It does not necessarily give a reasonably accurate indication of the maximum pressure developed, as is shown later.

Various methods have been used to record pressures in other types of arms and ordnance but such methods have not been applied to the measurement of shotgun pressures. Gun pressures have been recorded by A. G. Webster and L. T. E. Thompson by means of a calibrated spring of small inertia. Dr. G. F. Hull and Capt. H. O. Wood were the first to suggest the piezo-electric gage as a means of recording the pressure changes in guns. This work has been carried out with success by Drs. E. A. Eckhardt, J. C. Karcher and R. H. Kent. They have worked principally with ordnance.

IN order that pressure variations in shotguns might be investigated fully The Peters Cartridge Company has chosen the piezo-electric method because of its known superiority in this field. The apparatus described in this article was constructed by the Physical Laboratory of that company. The clear bakelite case which holds the crystals and other elements of the gage, and at the same time affords easy inspection, was suggested by Dr. Kent.

The apparatus consists of: a firing mechanism with provisions for transmitting the chamber pressure to a piezo gage; the piezo gage proper; a resistance-coupled amplifier to convert the charge developed by the gage to a measurable current, and an oscillograph-camera combination to record the current variations. Auxiliary equipment includes apparatus for the direct calibration of the gage, amplifier, and oscillograph, as a complete unit.

The pressure gun is essentially a standard pressure shotgun with changes such as; insulating the restraining bridge in order that it may serve as one of the contacts for the gage, and providing facilities for the calibration of the gage. Fig. 1 shows the manner of assembling the gage on the gun for taking pressure records. Fig. 2 is a photograph of the complete gun, assembled to take a record.

The piezo gage was assembled, as shown in Fig. 1, from quartz crystals having piezo-electric properties. When these crystals are stressed, by applying pressure to the opposite faces, a definite quantity of electricity is liberated. This charge is proportional to the stress. The crystals are connected by means of silver foil so that the negative sides of all of the crystals join a common conductor. In like manner the positive sides are connected to a common conductor. This gives a parallel connection, and the charge delivered by the two connectors is the sum of the individual charges liberated by the crystals. The complete gage will then liberate a definite charge depending on the force applied to it. It is this charge which is used as a measure of the pressure on the gage.

The voltage developed by the gage will depend on the capacity and charge in the circuit. A definite capacity is introduced to make the voltage range of the combination come within the voltage range of the measuring apparatus. In like manner, if a given load is released from the gage, a charge of opposite polarity and equal quantity is developed.

Fig 3 is a photograph of two assembled piezo gages. One is encased in a brass shell to protect it during handling, and the other is shown assembled in

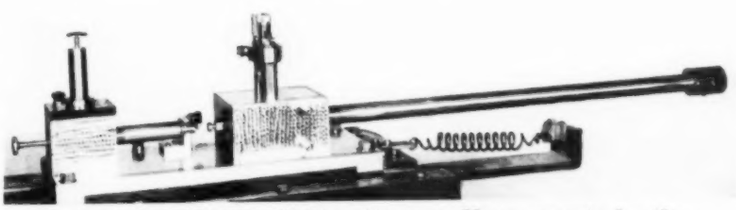


Fig. 2. Gun Used in Taking Pressure Measurements by the Piezo-electric Method.

*Chief Physicist, The Peters Cartridge Company, Kings Mills, Ohio.

the same manner except that the brass case has been removed. Note that the gage is loaded by means of a steel hemisphere. Steel plates at either end transmit the load to the crystals and are permanent parts of the gage. The clear bakelite case affords easy inspection of the gage as well as insultion protection. This enables the operator to remove

Fig. 3. Two Assembled Piezo-electric Gages.

One gage (left) is encased in a brass shell as it is normally used. The other gage (right) has the brass shell removed to enable inspection of the gage. Note the steel plates at each end of the crystals. The insulating case is clear bakelite.

the gage and handle it without danger of shifting the plates. It will be noted from Fig. 1 that the negative side of the gage is connected to ground through the piston and spring, whereas the positive end is connected to the restraining bridge which is insulated from the gun by means of bakelite.

The charge developed by the gage is transmitted to a condenser, to limit the voltage, which is connected to a three-stage resistance-coupled amplifier similar to that suggested by Dr. Hull. The leads are protected by armor to shield them from induction voltage effects from other circuits. The output of the amplifier is connected to an oscillograph of the vibrator type. The motion of the oscillograph element is recorded on a spiralling drum oscillograph camera constructed for the Physical Laboratory of The Peters Cartridge Company by the late Capt. Philip P. Quayle.

THE details of the calibration of the apparatus, and the recording of shotgun pressures, are outlined to show the relation of the calibration to the final record. The three-stage resistance-coupled amplifier, is adjusted in such a manner that the output current is directly proportional to the input voltage. Meters enable the operator to maintain the proper operating conditions, once they have been established. If the voltages on the tubes are held constant there is no change in the amplifier calibration, unless the tubes change their characteristics. This has been closely checked by means of the output meters on each tube, throughout a period of several months. Occasional calibrations of the complete amplifier were also made. The calibration at the end of a period of several months was the same as the original calibration. There has been less difficulty in maintaining the calibration than was anticipated.

When the amplifier is connected to an oscillograph element having a straight line calibration the resulting combination also has a straight line calibration. The frequency and damping of the oscillograph vibrator have an important bearing on the taking of shotgun pressure records. The frequency must be high enough to allow the element to follow the pressure variations. The vibrator element must also be damped so that it will not "overshoot" the maximum pressure, and indicate a value in excess of the true pressure. This requires close control on the temperature of the damping medium surrounding the oscillograph vibrator.

A record taken while a given voltage was impressed on the input of the amplifier shows directly how well the amplifier and oscillograph combination will follow a change in input voltage, and that the element is critically damped. The damping medium is oil and the temperature control is within $\pm$ 0.4° C. The small lines below the record are spaced 0.00097-second apart. As a further check on the ability of the element accurately to follow a rapid change in pressure, the record shown in Fig. 4 was taken. This is a record of the pressure variation of the fastest burning smokeless powder available, taken with two oscillograph elements simultaneously. The record with the highest deflection was the standard pressure element, while the lower record was made by an undamped element having a natural frequency of about 13,000 cycles per second. The vertical line is drawn through the maximum pressure of the high sensitivity element at right angles to the zero pressure line. The maximum of the undamped high frequency element falls on the vertical line showing clearly that the high sensitivity element is capable of following the pressure change.

Since the gage and amplifier are, for all practical purposes, instantaneous there is no possibility of their distorting the pressure curve.

HAVING adjusted the amplifier and oscillograph for satisfactory operation, the calibration of the piezo gage is the next step. This is accomplished by means of the lever system shown in Fig. 5. The gage is placed in its position with the steel hemisphere on top. The terminal of the gage which will become positive as the load is released is placed in contact with the insulated bridge. An insulating block is placed between the lever and the loading rod which extends down to the gage. It may be added that the holes in the loading lever are reamed, and a ground, close fitting, pin is used. The load is transmitted to the gage by a lapped

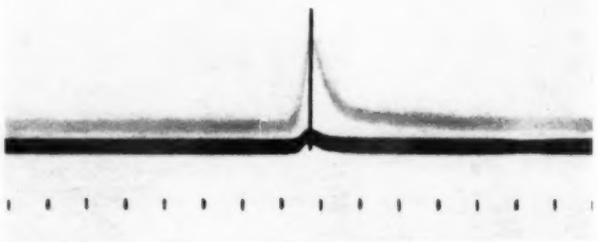


Fig. 4. A Pressure Record.

Of a fast burning powder made with a high sensitivity, damped element, and a 13,000 cycle undamped element in series. Note that both elements reach a maximum at the same time.

pin extending through a tight-fitting screw plug. This insures a constant-lever multiplication of the load. With this arrangement the insulated bridge is connected to a condenser of suitable capacity thence to the grid of the 1st tube of the amplifier. The gun is connected to the other terminal of the condenser which is connected to ground. A 4 megohm grid-leak is connected across the condenser to establish proper operating conditions on the first tube. After adjusting the lever, until it is level and the load is supported by the gage, the oscillograph camera is opened and the load

is suddenly removed by means of a toggle. The oscillograph is deflected a definite amount proportional to the load on the gage. By varying the weight and leverage used, the gage is calibrated over the entire range of shotgun pressures. The load on the gage is converted to chamber pressure and a chamber pressure-oscillograph deflection curve is plotted.

The gage has been calibrated over the entire range (0 to 15000 pounds per square inch as it is used on this apparatus). Frequent checks prove that if the amplifier adjustment is maintained there is no change in the calibration of the entire system. Individual observations, on a given point on the calibration curve, check within ± 1 per cent. A typical calibration record is shown in Fig. 6. It will be noted that the load was completely removed in considerably less than 0.001-second. The distance between two timing lines at the bottom of the record represents 0.00097-second. The objection may be raised that the discharge of the condenser through the grid-leak will introduce an error in the record. This discharge is shown on the calibration record in Fig. 6 and it will be noted that the downward slope of the curve, after the load has been removed, measures about 7.25 per cent of the maximum in 0.020-second, in this range, or about 0.36 per cent per 0.001-second. Thus if the barrel time was 0.003-second, and *the maximum pressure was maintained for the entire time,* the distortion would be a little over 1 per cent, or about the limit of accuracy obtainable with this apparatus. It is therefore readily seen that this effect can never introduce a serious error.

Fig. 5. Apparatus Set-Up to Calibrate the Piezo-Electric Gage.

After having calibrated the apparatus the lever mechanism is removed, the gage is reversed in order to have the terminal which will become positive for increasing pressure in contact with the insulated bridge, and a plug for loading the gage is placed in the bridge as shown in Figs. 1 and 2. The pressure exerted by the spring under the piston need not be considered because the motion of the gage is so small as to make any change of the spring pressure negligible. Therefore, unless the spring should break, it need not be considered. After punching and inserting a shell, it is fired by means of the mechanism on the rear of the carriage. This mechanism also opens the oscillograph camera prior to firing. A standard pressure barrel (12 gauge) recommended by The Sporting Arms and Ammunition Manufacturers' Institute is used.

SOME of the results obtained with this apparatus will be summarized briefly. Pressure records have been made with the piezo gage described in this article on practically every type and brand of shotgun powder. It may be mentioned that all the satisfactory loads of smokeless powder when tested had a considerable portion on the increase side of the pressure curve as a straight line. This portion decreased, however, as deterrent was added to the powder.

Black powder produces a distinctly slower rate of increase than any satisfactory load of smokeless powder. In general there is only a short straight line portion on the curve showing the increase of pressure when black powder is used. While it is possible to obtain a smokeless powder and primer combination with pressures even lower than those of black powder, the results are very unsatisfactory. The load will be very irregular in velocity and excessive muzzle flashes will be obtained. It is very difficult to obtain a satisfactory progressive powder having a maximum pressure less than about 9000 pounds per square inch. Maximum black powder pressures for average shot gun loads are, in general, in the range from 5000 to 5500 pounds per square inch.

From data obtained with lead crusher cylinders, on the various shells tested, the indications are that the lead crusher gage used with the tarage table, adopted by The Sporting Arms and Ammunition Manufacturers' Institute, indicate pressure values which are most nearly correct when a fast-burning powder is used. In fact for the fastest powders their indication of the maximum pressure agrees with the piezo gage measurements within 5 per cent on three lots of shells tested. When a slower powder is used the pressure indicated by the lead crusher gage is somewhat lower than the true maximum pressure. This is undoubtedly due to the fact that the piston acquires a considerable velocity when used with the lead gage and a part of the compression of the lead gage is due to the force required to stop the piston and that part of the lead gage near the piston.

Evidence of this is supplied by a series of tests made with a lead cylinder between the piston and the piezo gage. Two lots of shells were tested. One lot was loaded with a fast-burning powder and the second lot was loaded with a progressive-burning powder. From each lot the pressures were measured with the piezo gage on ten shells. Ten additional shells from the same lot were tested on the same day placing a lead test cylinder between the piston and the piezo gage. In this manner the value indicated by the lead gage can in no way be affected by the presence of the piezo gage. The piezo gage, however, will indicate the pressure on the uppermost layer of the lead cylinder. The average of the ten-shot tests of shells from the fast-burning lot of powder having a maximum pressure of 12,300 pounds per square inch gave a lead gage indication of a maximum pressure of 12,100 pounds per square inch. The piezo gage measurements made simultaneously as indicated above showed that the pressure transmitted to the piezo gage was equivalent to more than 16,000 pounds per square inch cham-

(*Continued on page 125*)

Fig. 6. A Typical Calibration Record.

The War of the Pacific, 1879-1883

Proof of the High Cost of Obsolete Ordnance

By T. M. Parks*

The significance of current military operations in South America adds to the timeliness of Captain Park's description of The War of the Pacific, a conflict of fifty years ago which is not generally credited with the importance it warrants. In addition to its other lessons the futility of defense with obsolete weapons is one of the major observations which the author emphasizes so strikingly. —Editor.

ON the subject of the relationship of peace and national defense, General Emory Upton, U.S.A., wrote: "A general does not so much regard the causes of war; his duty is to be familiar with military history and to know the details and principles upon which successful war is conducted. The statesman, on the contrary, should study peace and the causes which tend to preserve or destroy it. History will teach him that peace ends in war and war again ends in peace. If the causes which terminate peace and produce war can not be removed, and if the legislator does not recognize and know how to create a powerful army, he ceases to be a statesman. Within the present year (1880) a Senator of the United States, standing on the parapet of Fort Monroe and witnessing the firing of worthless smoothbore artillery, assured the author that we would not have another war in a century." (Between 1776 and 1880 the United States had 87 wars; from 1880 to date, 14 wars.) "No statesman would have made such a prediction. He would have condemned the useless ordnance before him and would have declared that wisdom and economy demand that we should be ready for any war whenever and wherever it may occur."

At the very moment that the above demonstration was taking place two of our neighboring Latin-American republics were being overwhelmed through their hope that they would not have another war in a century and, as a matter of economy, depending on ordnance similar to that mentioned by General Upton.

We can judge the future only by the lessons of the past, and history is filled with examples of the high cost of economy in defensive preparations. Napoleon III's government considered too expensive the superiority of fire offered by the 7-shot Spencer rifle of American Civil War fame and went down to defeat with the obsolete chassepot, which was discarded immediately after the war. Napoleon I, offered Fulton's steamboat as a means of invading England, rejected the idea as not worth the cost of development, and sank his hopes in sailing ships at Trafalgar. Mohamet, after the capture of Constantinople, expressed amazement that so rich and tempting a prize should have been so cheaply and inadequately protected. Archaeologists digging on the site of the Battle of Wisby found the best armor of the period filled with the skeletons of children, cripples and hunchbacks—the thrifty tradesmen had economized the cost of a standing army after buying the equipment for one. In this paper it is the author's intention to present in the history of the War of the Pacific, not the legal angles of the friction but the situation from which the military leaders endeavored to extricate their countries after diplomacy had failed, and the facilities which their civil governments had placed at their disposal.

In explanation of the political lives of the nations below the Rio Grande it may be remembered that no Mayflowers filled with settlers went to Latin-America in the early days. Instead went warships filled with fierce "conquistadores" who, after beating the natives into submission, started fighting among themselves and left their turbulent heritage to their descendants. So it was that Peru, Bolivia and Chile, the three participants in 1879, had been more or less uniformly torn with revolutions, civil wars and quarrels with their neighbors in the six or seven decades of their independence from Spain.

It is also to be recalled that during the American Civil War, while the Monroe Doctrine was submerged under more important domestic considerations, besides the French effort in Mexico with Maximilian there was an attack by Spain on her erstwhile colonies in which Chile captured the wooden steamer Covadonga and the Peruvian forts at Callao repulsed an attack on that port. With Bolivia a triple alliance had been formed but after the elimination of the Spanish peril in 1866 Chile drifted apart from her former allies.

It cannot be said that either Peru or Bolivia were without warning as President Ramon Castilla (1846-56), who was to Peru much that Lincoln was to the United States in that he brought ten years of order out of chaos, and freed the slaves, warned: "If Chile buys one ship, Peru should buy two," as Marshall Andres Caceres, a later President, said: "Warning who was the enemy we might fear and in which direction danger lay—from the sea."

In recognition of the situation Peru and Bolivia entered a secret alliance against aggression on February 6th, 1873 and endeavored to draw Argentina into it in 1877. However, Argentina did not join and the Chilean Minister at Buenos Aires was informed of its existence. Nevertheless, the outbreak of hostilities in 1879 so took Peru by surprise that her coast-defense guns at Callao were not yet mounted.

AT that time Peru possessed a territory approximately the size of the American Eastern seaboard from Maine to Florida, inclusive, and as far West as Chicago, with a population of two and three-quarter millions of whom more than half were Indians, one quarter mixed bloods and the balance Negroes, whites and Chinese. The freed Negroes constituted a serious menace in that they were unprepared for freedom when they received it and no adequate provisions had been made for them. Whenever law and order broke down they and the more unstable of the half-castes created a reign of terror, of which the worst occurred in Lima after the destruction of the Peruvian Army in 1881. The most profitable in-

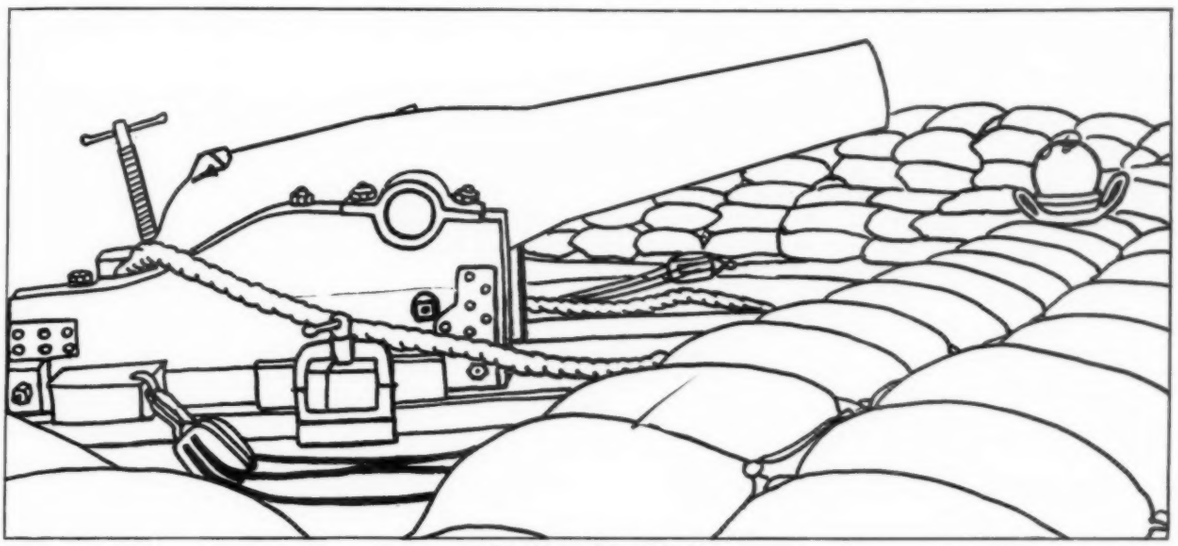
*Provisional Student-Stretcherbearer Battalion, Peruvian Army, 1914 Revolution, Captain, Quartermaster Corps Reserve, U. S. Army.

dustries were nitrate and guano. Peru's external debt amounted to about $320,000,000. with annual interest of about $20,000,000. on which payments were suspended.

The Peruvian Army consisted of 2500 infantry, 1000 artillery, 780 cavalry, a force which could not be called homogeneous as the infantry were poor Inca Indians, speaking Quechua, most of whom had been recruited by force, their villages surrounded and all men who were caught driven away to serve in the ranks. The cavalry and artillery were mostly Spanish-speaking Negroes and half-castes, the former wretchedly mounted, the latter armed with cast-iron muzzle-loading 3-inch guns made in Lima and almost useless against the Krupp guns of Chile. The infantry had Peruvian and French chassepots and Minie single-shot rifles, the cavalry, Spencer and Winchester repeating carbines, with a total of 1,000,000 cartridges of various calibers. The national guard of 60,000 men had received no training in four years and practically no provision had been made for their equipment.

Furthermore, Peru in order to mitigate her financial difficulties, had been retrenching on her navy. No new man-of-war had been bought in ten years. The turret-ship HUASCAR built at Birkenhead by Messrs. Laird in 1866, was 200 feet long, 1130 tons, 300 h. p. The armor around her revolving turret was only 5½ inches in thickness and there was a belt of 4½ inches. Such armor was worse than useless against the fire of the Chilean ironclads for the shells penetrated and burst inside. She was armed with two 10-inch Dahlgren 300-lb. and two 40-lb. Whitworth guns. The INDEPENDENCIA, a broadside type ironclad, was 215 feet long, 2004 tons, 550 h. p. and had 12 70-lb. guns on the main deck and 2 150-lb., 4 32-lb., and 4 9-lb. on the upper deck. Two wooden corvettes and two antiquated monitors that were not seagoing completed the Peruvian navy. These last were bought in the United States in 1869 and were 253 feet long, 2100 tons, and had 10-inch iron around the turrets and two 15-inch smooth-bore Rodman guns. They were merely floating forts. All of the ships were in bad condition and needed repairs. The crews were poorly trained, especially in marksmanship due to the fact that ammunition was scarce. Her finances were such as to permit only the most urgent expenditures.

BOLIVIA, in area about two thirds the size of Peru but mostly in the Andes mountains so poorly situated that most of her trade went through Peruvian ports instead of her own port of Antofagasta, had a population of about two million desperately poor Indians and a few whites. She had suffered as did the other South American states from poor administrative and political organization, and her handicaps in transportation had prevented her industrial development, a condition which was aggravated by continued revolutions.



The Hope That Failed.

Eleven-inch Dahlgren gun at Miraflores, depended on to save the capital, was no match for the Chilean Krupp guns. Two days' Peruvian casualties were 6000 killed, 3000 wounded.

The Bolivian Army of 2000 men of all arms was scattered throughout her territory. One battalion of infantry had Remington single-shot rifles and the cavalry had Remington carbines, in all 1500, and the others had percussion lock muzzle-loaders. The artillery had two 3-pounder guns and 4 machine guns. The national guard of 54,000 men was composed mostly of Indians with little or no training. Bolivia did not have a single warship.

ON the other hand, Chile, with an area of approximately one-third of that of Peru occupied the western slope of the Andes for nearly half the length of the continent and had a population of two million thoroughly homogeneous descendants of Spanish-Indian half-castes who had lost all traces of their Indian traditions. The external and internal debt was over $50,000,000. and the national income scarcely enough to meet current expenses and interest. Of about $15,000,000. yearly receipts, one-third was employed in payment of interest.

The Chilean Army of 2500 infantry, 800 artillery and 700 cavalry, was perfectly organized, trained and equipped and was increased to 13,000 of all arms upon commencement of hostilities. The national guard of 25,000 was increased to 55,000. Small arms were: infantry, Comblain rifles, cavalry, Spencer and Winchester carbines, with a reserve of other systems and 3,000,000 cartridges, all of the same caliber. The Chilean artillery was exceptionally effective with well found accoutrements and mules in fine condition. Their field

guns, mostly Krupps and Armstrongs, and their Gatling and Nordenfeldt machine guns completely outclassed those of their opponents. Their 12-pounder Krupp guns with a range of 4,000 yards could commence an action which could not be returned by the Peruvian gunners. This enormous advantage alone was sufficient to account for the successes of the Chilean operations.

Chile had been quietly but busily increasing and strengthening her navy for six years and when she declared war it was formidable. It consisted of two powerful ironclads of the newest construction designed by Reed and built at Hull in 1874-5, the Almirante Cochrane and the Blanco Encalado, of 3560 tons and 2920 h. p. They carried six 9-inch M. L. Armstrong guns of 12 tons, some light guns and two Nordenfeldt machine guns. The armor was 9 inches thick at the water line and 6 to 8 inches around the battery. Both were twin screw. Chile also had two sister corvettes, the Chacabuco and the O'Higgins of 1670 tons and 800 h. p. armored with three 150 pounder, 7-ton Armstrong guns, and four 40 pounders; the Magallanes with one and the Abtao, corvettes, with three 150 pounders, the Spanish Covadonga and the wooden Esmeralda, as well as ten steam transports.

In the opinion of the noted English historian, Sir Clements Robert Markham, the two Chilean iron clads, if well manned and properly handled, were much more than a match for the entire navy of Peru.

With regard to the danger from the sea, of which President Castilla had warned Peru, Historian Markham wrote: "The contest between Peru and Chile was one the result of which depended entirely upon the possession of the sea. All the Peruvian railways were at right angles to the coast and there were no means of conveying troops except by sea. The distances are enormous and the marches are over vast desert tracts, without shade or water, the fertile valleys occurring at long intervals. Consequently an invader from the sea can select his point of attack at pleasure, and, so far as the region between the Andes and the sea is concerned, its conquest is then only a question of time."

The Peruvian-Bolivian coast line of 1400 miles was fortified at only one point, Callao, whose guns had a range of only a few kilometers. These guns, 53 in number and of different systems and calibers, from 32 to 500 lbs., were unmounted when war broke out. Ammunition at hand did not total 1800 shots. The rest of the coast was left to the fleet.

The war on land consisted of a revolution in Peru in which badly needed men and equipment were lost but a more aggressive leader placed in charge, and three land campaigns in which the Peruvians won but one battle. On the sea there was early success to the Peruvian navy in which a Chilean troop ship was captured and the Huascar sank the Esmeralda by ramming her three times, being unable to sink her by gunfire in spite of superior armament. But the loss of the Union, which ran aground, was followed by mutiny aboard the Huascar and its capture. By January 1881 the Chilean commander was able to report: "The Peruvian navy does not have even a single row boat."

THE career of the Huascar after the loss of her consort, Union, when single-handed she long eluded the chase of the two Chilean ironclads each more powerful than herself, and kept the enemy in a state of constant alarm, is the most interesting episode of the naval war in the Pacific—a war in which Miguel Grau, its renowned commander, is the true hero.

At Antofagasta, Bolivia, on August 27, 1879 Captain Grau missed an opportunity to strike a body blow at the Chilean Army when, if instead of engaging the ships and forts he had turned shot and shell on the condensers on shore, which supplied the town with water. Had he destroyed them he would have compelled a force of 7000 Chilean troops, encamped and ready to invade his country, either to surrender or perish from thirst.

Miraflores Fort in 1915.

Showing the loop-holed *tapias*, used instead of trenches, and a Dahlgren with muzzle blown away.

It was on this occasion that a Ley torpedo was launched by the Huascar and directed at the Abtao but through some derangement of the machinery it had no sooner been shot into the water than it turned and came straight back toward the Huascar. If it had struck her the fate of the turret ship would have been sealed, but one of her officers, Lieut. Diez Canseco, sprang overboard and succeeded in deflecting it from its course.

The Huascar put back into Callao and to avoid being bottled up in the harbor put to sea to sell herself as dearly as possible to the overwhelming Chilean navy. Of the ensuing events histories do not agree. According to one of them, a heavy percentage of the crew on the final cruise were shanghaied foreigners who staged a bloody mutiny, seized the British barque Rutlandshire, helped themselves to her water, food and coal, fought off the British gunboat Pasha, and voted a career of piracy. After six hours the crew defeated the mutineers and gave his command back to Admiral Grau.

The end came a few days later when, on October 4, 1879, at 9:25 A. M. the first shot of the first action that had taken place between seagoing ironclads was fired at the Cochrane from the Huascar's turret at 3,000 yards. It fell short. The fourth shot from the Cochrane struck the turret of the Peruvian monitor temporarily disabling the revolving apparatus. The Huascar's turret was worked by hand and not by steam. Almost at the same moment a shot from the Huascar struck the side of the Chilean, loosening and slightly denting one of the iron plates. The ships had now closed considerably and Admiral Grau made an attempt to ram his antagonist but the twin screw Cochrane was too fast and was able to turn in half the space required by the Peruvian. Several later attempts were out maneuvered and also failed.

At 9:55, half an hour after the first shot, a shell from the COCHRANE struck the pilot tower of the HUASCAR. It exploded inside, killing Admiral Grau and two of his lieutenants. Up to the moment of the bursting of the fatal shell the ship had been maneuvered with skill and daring; yet the firing on both sides was indifferent, a very small percentage of shots taking effect. Shortly after 10:00 A. M. the BLANCO ENCALADO reached the scene of action and fired her first shot at the doomed HUASCAR. By the time the four next succeeding commanders had been killed or wounded the HUASCAR was quite disabled. Her steam steering gear had been rendered useless by the same shot which killed the admiral and from that time it had to be steered by relieving tackles hooked below. As there was no voice tube leading from the upper deck to the place where the men were steering, the words of command had to be passed down by messengers, with resultant confusion. A shot entered the turret rendering one of the guns useless and the turret was disabled. Still the HUASCAR fought on.

Followed an attempt at boarding but although half of the crew was dead the attack was repulsed in terrific hand-to-hand fighting and the ships drifted apart, firing furiously, the HUASCAR from only one gun. In the end the flag came down and an Irish seaman who was there relates that he stood on the poop and remarked: "This would be tough on Grau," to which his shipmate replied: "He ought to have been an Irishman." "Well, I'm damned if they get his ensign"—so they wrapped Miguel Grau's flag around a cannonball and dropped it in the ocean. Histories disagree as to the casualties but this sailor claims he is one of 86 who survived of a crew of 216.

The total number of rounds fired by the COCHRANE was about 46, and by the BLANCO, 31. Out of these 77 shots only 24 took effect on the HUASCAR. Only Pallister shells were used by the Chileans. They burst after penetration, showing that the weak armor of the HUASCAR was worse than useless. The HUASCAR fired about 40 rounds but there was a lack of precision in the aim owing to insufficient practice. Those shots which struck the COCHRANE at a distance of about 600 yards at an agle of 30° penetrated about 3 inches, starting the bolts and inner lining and breaking an iron beam. The projectiles were broken into small fragments by the impact.

As against the almost harmless cast-iron round shots of the HUASCAR, the Chilean gunboat ANGAMOS showed the immense advantage of using very long range guns. Her single gun was a 180-pounder 8-inch B. L. Armstrong. With this weapon she was a terror to the batteries and forts of Arica and Callao. She would have been a formidable antagonist even for an ironclad. After doing a large amount of mischief along the coast and having fired 380 times in ten months, the gun recoiled through the trunnion coil and sank in deep water.

The remainder of the Peruvian fleet was sunk in Callao harbor to prevent capture and the only further naval loss suffered by Chile was the COVADONGA which fell into a trap and was blown-up while hoisting aboard a handsome launch filled with dynamite.

ON land, after the Peruvian victory at Tarapaca, at the beginning, the war was a succession of increasingly crushing defeats. Small Bolivian forces fought desperately beside their allies at Pisagua, San Francisco and Tacna but the valor of the individual could not overcome the poor leadership and wretched equipment which handicapped them. At Arica the Peruvians under Colonel Bolognesi fought "to the last cartridge" in vain. So superior was the Chilean artillery to the Peruvian that during the retreat from Tarapaca the Peruvian commander armed his men with Winchesters and abandoned his guns.

Followed the final Lima campaign with the land battle which captured Chorrillos, twelve miles from Lima, in which the Chileans had 26,000 veteran troops and a fleet and the Peruvians 23,000 of whom 2,000 were veterans and the rest recruits. The official Chilean casualties were 797 killed, 2522 wounded. Unofficial Peruvian casualties were 4,000 killed, 2,000 wounded, a mute testimony to the value of obsolete guns and courageous but untrained troops.

Poor strategy again lost to the Peruvians an opportunity to strike a telling blow. On January 13, 1881 after the capture of Chorrillos, the Chileans were so overcome with victory that they engaged in what the Chilean official reports referred to as "fratricidal warfare" in which Markham estimates they killed 400 of their own men, and had the Peruvians attacked then, instead of waiting in the second line at Miraflores to be attacked, they could have saved their capital easily.

It was the author's pleasure to live at Miraflores some 30 years after the battle where recovery had been so slow that except for the rebuilding of most of the ruined houses the town was much the same as immediately after the battle. Bullets were still to be found in walls near the central redoubt, a dozen rusted 3-inch muzzle-loading cannon lay in the streets, cannon balls from 1½-inch to 15-inch were in abundance. I found a fully loaded 8-inch modern style shell of the ANGAMOS in an irrigation ditch just outside the town. In gardens rifle barrels and bayonets were to be seen supporting rose bushes and in the fields they were occasionally to be found woven into wire gates. Due to the rainless weather an adobe house preserved as a memorial still showed the smoke marks of its burning in 1881, and south of the town was the central redoubt with its 11-inch Dahlgren gun, the muzzle blown off by the Chileans. On the cliff overlooking the sea was the Alfonso Ugarte redoubt, its two Rodman guns gone but its deep trenches intact in places and blown-in in others, just as they were when its garrison gave up trying to fight a navy with single-shot rifles.

OF particular interest were the tamped earth walls called *tapias* used instead of trenches by the infantry. Due to lack of wood, and wire rusting in the salt air, all fences and house walls were made of earth or adobe. Some of the *tapias,* 20 feet high, hollow and so wide that a man could run crouched inside them, were supposed to be 400 years old. Others, dated anywhere up to the time of my examining them, could be easily identified by style of construction and state of preservation, a deep path being worn in the tops of the older ones by pedestrians who walked on top of the *tapias* instead of through the fields. Most of them were made of three tiers of sections about 12 feet thick, 15 feet high, and 36 feet long. Those of peace time were built solidly whereas those built during the war had 4 foot spaces between the ends of bottom and middle tier sections, affording excellent coverage from anything less than a direct hit from a cannon shot. Unfortunately, the Peruvians had built

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Month by Month

THE Geneva Disarmament Conference quietly folded its costly trappings and hung-up the shutters on July 20th with little or nothing accomplished. To be sure there was a final resolution outlining the generalities on which the conferees were in agreement. Having gotten off on an unsteady foot as disarmament discussions sometimes do, the final struggle of the Geneva set-to was even less than a gasp. This for the simple reason that Germany and Russia voted against the resolution. Italy was among the eight who answered "present but not voting" while representatives of 41 nations registered their votes in favor. The numerical strength of the ayes as against the small but tremendously powerful noes reminds us of the town-hall meeting where the timid souls vote for bigger and better suburbs and a few land-owners and builders say no. So three of the essential parties withheld their sanction to the important final resolution at Geneva.

Disarmament Swan Song?

The big question in the minds of the expensive delegations was "When shall we meet again?" Germany has said that she will not attend another session unless the Treaty of Versailles is scrapped. At the Reichswehrministerium, home of the German Ministry of Defense in Berlin where the Landwehr Canal cuts through the city's heart, Generalleutanant Kurt von Schleicher, minister of defense in the von Papen Cabinet, said that Germany cannot wait for arms equality. Denying militaristic aims the general warned that his country will not return to another Geneva arms party unless Germany's demand for security is met in advance. In Italy Signor Mussolini extolled the ennobling benefits of war. And so the tangle trips merrily on.

For our Geneva effort to abolish tanks, heavy field guns, bombing planes, etc., there were appropriated 450,000 scarce American dollars—a slightly high cost for a battle of words. Of special interest in this connection was the statement of Ambassador Gibson, head of the American delegation to the Conference when he presented the American proposal of abolition. "To illustrate the drain which these weapons cause to the budgets of the world," said Mr. Gibson, "I need only state that the largest type of heavy mobile gun *without its mounting* costs approximately $450,000, and that its life is not long." This is a strange coincidence of costs—the Conference apparently cost us only as much as one of our heavy mobile guns! Stranger still because our largest type of mobile gun, the 14-inch on railway mount—according to estimates presented to the Congress some years back—cost $180,000 for the gun and $250,000 for the *railway* mount, an actual total for *gun and mount* of $430,000 and a mere $270,000 Ambassadorial discrepancy in the cost of the gun itself. The accuracy life of the gun is about three score and ten shots, but when retubed that life begins over again. The life of the carriage is the normal span of railway equipment not in frequent use. Overlooking the inaccuracy in figures which may or may not be typical of the estimates of disarmament conferees we still have the actual cost of the largest American mobile gun and mount complete just 93 per cent of the appropriation for the American delegation to Geneva.

On the basis of real comparative values we hesitate to draw the conclusion. This much can be said for the few superb railway mounts we have—they exist and they will do a good job whenever necessary. Like British observers who philosophized after the captains and the Ambassadors departed from Geneva we too ask "What have we got?" For ourselves we repeat the question and we answer it: We have got our guns, and we had better hold on to them. They talk only on rare occasions but when they do, they mean business. Their talk counts!

NOT so long ago announcement was made that three new types of caissons are under development for the Army—but they are to be known as ammunition wagons. They are all of the 5th wheel steering type with pneumatic tires and semielliptical springs. They are provided with interchangeable drawbars for motor draft and with standard horse-draft equipment for use when desired.

"Keep 'Em Rolling"

The ammunition wagon, T2, is designed to transport 96 rounds of ammunition for the 75-mm. gun, M1897 in fiber containers secured in bundles of six rounds by means of Signode bands. This vehicle is a commercial development designed to replace the ammunition wagon, T1, developed in the 1st Cavalry Division at Fort Bliss. It weighs, empty, about 1,500 pounds; loaded, 3,900 pounds.

The ammunition wagon, T3, is similar to the T2 except that it is much lighter. It is designed to transport 66 rounds of ammunition for the 75-mm. howitzer in fiber containers secured in bundles of six rounds by means of Signode bands. This vehicle is intended to serve for transporting ammunition for the experimental 75-mm. howitzer unit being manufactured for test in the Cavalry Division. It weighs empty about 1,000 pounds; loaded, 2,500 pounds.

The ammunition wagon, T4, has a frame which is dropped over the rear axle giving a very low loading height. It is designed to carry 108 rounds of ammunition for the .75-mm. gun, M1897 secured as described above. This is a commercial development designed to replace the 75-mm. limber and caisson. It weighs empty about 1,600 pounds; loaded, 4,350 pounds. This vehicle can also carry 57 rounds of ammunition for the 105-mm. howtizer, M1, in fiber containers secured in

three-round packages by means of Signode bands. Or it can carry about 24 rounds of 155-mm. howitzer ammunition.

This sounds and is, no doubt, all very fine. Anything that hastens mechanization is all to the good. But let's not do too much scrapping of nomenclature in this day when traditions and the lure of old names are taken all too lightly. If the beloved caisson is to go in fact, let's hold on to the name anyway. It's romantic. It stands for so much. It is far more glamorous and inspiring than any kind of a wagon ever could be. The new undemonstrative and sometimes tricky terms which pervade our modern existence are having a harmful, unromantic effect in daily life. They ought to be kept out as far as possible from the ancient and honorable profession of arms and munitionment. For instance, the plethora of "shoppes" and "parlors" is enough to strangle the imagination and produce disgust. We must go now to a tonsorial parlor or a male beauty shoppe instead of the good old barber. A funeral parlor or mortician ends it all for us instead of the old-fashioned undertaker. Even the felon is hustled off by the executioner instead of by the hangman and he lies in a cemetery instead of a grave-yard.

So in armament. Why not improve the thing to our hearts' content but keep the old names? No one can get enthusiastic much less heroic about "lumbering ammunition wagons." And who can blend in heavenly harmony "our ammunition wagons go rolling along"? Oh, no, let's call them caissons. With their new rubber tires, they will roll more easily and with the old name we can the better "keep 'em rolling" in song and story and in battle.

Down to Definitions

IT is stimulating to read articles on military subjects in the American magazines of general circulation. Of course the reading public has a long way to go before its interest is developed to the proper level where advanced thinking on solid lines is the rule rather than the exception. None the less *The American Mercury,* for example, in its September, 1932, issue, displays that interest-breeding proclivity by the publication of Arlington B. Conway's article on Tanks. We can stand more periodicals devoting space to this and kindred subjects, we need more Conways and as a result of the two more thought and discussion. People with their feet on the ground will relish it just as, we believe, readers of ARMY ORDNANCE will take renewed interest in the little scrap now going on in these pages on Possibilities of the Tank. Real progress is made that way.

It is not our purpose to take exception to the observations of Mr. Conway. Facetiously we may observe that he and others interested in armored vehicles might follow this Journal when he and they are not satisfied with the treatment given the subject by the American service journals. ARMY ORDNANCE makes no claim to such a title, hence is not subject to the complaint that "for evidence that the United States Army does not follow this national bent in this particular (mechanization of military forces) it is only necessary to refer to any of the American service journals. In the last few years practically every issue of every one of them has had one or more articles about the new warfare of machines on land, but for the most part these articles have merely described the equipment or experiments of some other Power, usually Great Britain."

What we do take occasion to stress is the Conway conclusion in answer to the questions "What is the definition of a tank?" and "Will it be possible to prohibit the development of *ersatz* tanks, camouflaged as agricultural tractors or as commercial vehicles for crossing the Sahara Desert or the barrens of Northern Canada?" The conclusion is that as armies utilize other types of self-propelled weapons they cannot easily be denied all forms of automotive transportation. Hence, the definition of a tank only technically can be limited to a motor-propelled vehicle, capable of crossing ordinary terrain, protected by armor and carrying guns or machine guns. Which brings the question down to one of definition and its important bearing on the Geneva badinage over offensive and defensive weapons. Experts should be grounded in definitions. They and others interested in both sides of the question should read, for instance, the debate in *The English Review* between General Fuller and Captain Liddell Hart. Superb student though Liddell Hart is, Fuller has the better of the qualitative disarmament argument. Both are grounded in definitions, of course, because both have made them. Fuller, however, knows the meaning of relativity—not in the Einstein interpretation, thank Heaven. As he says, "The argument of aggression, unless examined from the relative point of view, is illogical. If it could lead to the abolition of war well and good; but if, instead, it can only reinstate a more barbaric form of war, I fail to see that anything beneficial will have been accomplished." Hence the answer is that military mechanization cannot be abolished or even restricted without abolishing the mechanical sciences and industries themselves. So it is not a matter of defining only this tank or that, this weapon or that—it is a question of familiarity with the definition of possible and impossible, of barbaric warfare versus civilized warfare, of men behind armor as against men behind reeds. Once these dictinctions are granted then types of weapons are details and the thought of Mr. Conway is entirely sound ". . . it does not seem unlikely that patriots thinking of the nation's safety might allow themselves some latitude in the definition of a tank."

An Ordnance Leader Passes On

NEWS of the death on August 2nd of Maj. Gen. Sir Charles Massey Mathew, K.C.M.G., C.B., D.S.O., former Colonel Commandant of the Royal Army Ordnance Corps of the British Army, brings to us on this side of the Atlantic a share in the bereavement of his Corps and of the Royal Army Ordnance Corps Association of which he was president.

Sir Charles was a great soldier who served with distinction in many posts of unusual responsibility. His administrative genius in handling the problems of munitions supply and transport on the Western Front developed from a lengthy service with his Corps which culminated in his advancement to Colonel Commandant. For American readers not so generally acquainted with the gallant record of this sterling officer and administrator, the following appreciation from *The Royal Army Ordnance Corps Gazette* is cited:

"This is not the occasion for attempting to appraise Sir Charles's share in the great development of the R.A.O.C., which has gone progressively and so happily forward since 1904. The fact that he successively held since that date nearly every big peace-time or war-time administrative post in the Corps sufficiently indicates the part he played. At a very

early period in his Ordnance career he put before himself the ideal of helping to lift Ordnance Services from the obscure and anomalous position they then occupied to their rightful place in the Army. Our annals show how resolutely and to what good effect he adhered to his purpose. It needed some courage in the days when 'K' was a symbol of terror to officers, regimental and administrative alike, to challenge the authority of Lord Kitchener, an autocrat who brooked no argument or opposition. But Mathew, a quite young officer in the Department then, did it and though at Khartoum, after the rout of the Dervishes, he was ordered by the Sirdar to get back to his 'proper' place at once, far out of sight and touch with the troops and clear his stores out of the Soudan within a week, he was mentioned in the Sirdar's dispatches and awarded the D. S. O."

To our bereft Ordnance comrades in England American friends and admirers extend condolences. The leadership of Sir Charles in upholding the great traditions of Ordnance in the British Empire will be a biding influence as well to the disciples of St. Barbara in this country as to her worthy followers who were friends and associates of the late Colonel Commandant.

COLONEL SEWELL'S discussion of some of the needs of munitions preparedness in this issue of ARMY ORDNANCE is both timely and to the point. As an Ordnance District Chief of long experience he knows the possibilities and limitations of the general problem and he states them quite frankly. We believe that there can be no general disagreement with the essential and immediate needs as stated. Factory plans are not much account if they are not current. Even in prosperous times these plans are of some expense to the companies concerned and the cost grows to prohibitive proportions when business is slack, overhead is reduced and machines are idle.

Factory Plans and Educational Orders

The necessity of keeping factory plans current brings up the question of government funds now being spent on so-called self-liquidating projects. No proper activity for government expenditures is quite so self-liquidating as national defense. While we hear all too much about the cost of past wars, bonus marchers and what not, it is a queer form of anopsia that will not see the relation and disproportion of pre-emergency and post-emergency expenditures. The latter are always so big because the former are always so small.

However, the popular mind sees little that is self-liquidating about national defense. That mind is short-memoried enough. It forgets the lessons of a generation ago, or a decade or even a year and sometimes a month gone by. Unless the project will produce immediate returns the game is not worth the candle. How absurd! When the next war comes—whenever it does—every penny spent on national defense and particularly on factory plans will pay dividends that will make the present understanding of the term self-liquidating about as cramped as the first attempts to fly the English Channel now seem in an era of trans-Atlantic solo flights.

Allied to this is the question of educational orders which Colonel Sewell emphasizes. It might be well here to restate the matter for the information of readers. Of course authorization for educational orders involves more than a matter of appropriation of funds, it is a question of new legislation. All funds appropriated must be expended in accordance with existing law. Section 3709, Revised Statutes, which requires competitive bidding, provides "all purchases and contracts for supplies or services in any of the departments of the Government, except for personal services, shall be made by advertising a sufficient time previously for proposals respecting the same when the public exigencies do not require the immediate delivery of the articles or performance of the service." Section 5a of the National Defense Act further governs. It prescribes "The Assistant Secretary of War . . . shall cause to be manufactured or produced at Government arsenals or Government-owned factories of the United States all such supplies or articles needed by the War Department as said arsenals or Government-owned factories are capable of manufacturing upon an economical basis." In view of these controls it is not possible for Congress to appropriate, or for agencies to expend, money for educational orders until new legislation is enacted.

The scheme of educational orders was first considered in Congress in 1927. At that time Hon. Edith Nourse Rogers introduced a measure (H. R. 14695) modifying Section 5a of the National Defense Act, that would permit the Assistant Secretary of War to place such educational orders as he deemed desirable with commercial firms. The measure was actively supported by the then Secretary of War, Hon. Dwight F. Davis; by a former Assistant Secretary of War, then Congressman J. M. Wainwright, and by the Assistant Chief of Ordnance in charge of Manufacture, General Ruggles.

It failed of enactment and was reintroduced in 1929 at the request of the Secretary of War. After extensive hearings, where the bill received the active support of the War Department, it was reported favorably by the Committee on Military Affairs with extensive amendments. As amended the bill provided that educational orders might be placed for technical, non-commercial articles, but required prior advertisement for bids, the Secretary being authorized to select other than the lowest bid. It required the number of such educational orders to be held to a minimum in the interest of economy, permitting only one order to a given firm in a period of three years. It required that the plant and its processes be open to inspection by any person designated by the Secretary of War during execution of the educational order. It provided that factory plans for war-time manufacture of the article be included in the order when directed by the Secretary of War. Finally, it authorized the expenditure of not to exceed $1,000,000 in each of the next five fiscal years *out of funds appropriated* to carry out the provisions of the bill. Though reported out by the Committee on Military Affairs, the measure was not enacted.

The attitude of the War Department toward educational orders remains unchanged. The department is very favorably disposed toward such legislation. But under the unusual financial conditions now prevailing and the rigid necessity of limiting expenditures to absolute requirements, it is safe to conclude it will not indorse any new measure, however deserving, if that measure involves the appropriation and expenditure of additional funds.

At the present time two identical bills covering educational orders have been introduced in the House by Mr. Goss (H. R. 5601) and in the Senate by Senator Bingham (S. 1660). They cover *in general* the points outlined with regard to the final 1929 measure, but provide for an additional appropriation of $2,000,000 per year for each of the succeeding five fiscal years.

It is assumed that the War Department, in line with its current policy of economy will not indorse that provision requiring additional funds, but with this exception is favorable to the bill.

Nor can the Department be blamed. It has had to trim its wick perilously close to the flame already. It is for the people through their chosen representatives in the Congress to insist that educational orders are vitally self-liquidating—as much and, in cases, more so than efforts to enforce unenforceable and unpopular laws, the building of elaborate federal structures and, as has been said before, the artificial control of agricultural products and the printing of pamphlets on *acrididae* and *silvanus surinamensis,* otherwise known respectively and respectfully as the grasshopper and the corn beetle.

T. R. on the Ramrod Bayonet

BIBLIOPHILES of armament lore as well as admirers of the manly art of self-defense will be "dee-lighted" with the following gem, the original of which is now given the prominence it deserves in the collection at the Springfield Armory:

"WHITE HOUSE,
WASHINGTON. January 4, 1905.

"THE SECRETARY OF WAR:

"I must say that I think that ramrod bayonet about as poor an invention as I ever saw. As you observed, it broke short off as soon as hit with even moderate violence. It would have no moral effect and mighty little physical effect. I think the suggestion of a short triangular bayonet a great improvement. After you have gone over this subject of the bayonet and the sword, do take it up with me.

"I wish our officers could carry rifles. If they carry any sword they ought to carry a sword that they can cut or thrust with. Personally I do not see any point in having the cavalry armed with a bayonet, even though the modern cavalryman is nine times out of ten on foot. He might have a sword in his belt, only it ought to be a sword that can do damage.

"I am particularly anxious that we should have a thorough test made of the long and the short rifle (that is of the 24-inch and 30-inch rifle) at some place like that in Utah where several companies of men can be employed at firing both weapons at long ranges. This ramrod bayonet business does not make me feel that we can afford to trust too much to theory of the closet variety. I would like to have the opinion of Captain March, and then the opinion of the other military attachés who saw the fighting between the Russians and Japanese, about both the bayonet and the sword. I would also like to have the opinion of any of our officers in the Philippines who have seen the bayonet actually used.

THEODORE ROOSEVELT."

There are many traditions connected with the bayonet that grace the pages of history from its inception in the 18th century. The pike was simply the name applied to the lance or spear when used by infantry. With the match lock the idea of fitting a blade to the muzzle was impracticable. But the flint lock was transformed as early as 1647 by Marshal de Puységur by the application of the earliest bayonets. From then on the records of armament are replete with incidents and developments which in our own country occupied the deliberations of General Staffs and even of Presidents. The letter of the ex-President is an interesting commentary in more ways then one. It is food for thought even in these days not only from the armament standpoint but also because it is a sample of intense interest—with the famous T. R. bang!

The Four Army Plan

AFTER long deliberation by the General Staff a modification of the administrative distribution of our military strength has been created. It consists of four field armies superimposed upon the organization of the present corps areas with headquarters strategically located. These are First Army, New York; Second Army, Chicago; Third Army, San Antonio; Fourth Army, Omaha for the present and ultimately San Francisco. The plan specifies that the senior corps area commander in each army area becomes the army commander.

The new arrangement has many advantages. Especially because it designates one commander for defense sectors it simplifies problems heretofore divided among two or more corps areas. Thus the First Army defends the New England area; the Second Army defends the Great Lakes region with the added function of a mobile reserve for the units controlling the other borders; the Third Army defends the Mexican border, the Gulf and South Atlantic; and the Fourth Army defends the Pacific and Northwest frontier.

There are some debatable points in connection with the plan with which there may not be general agreement. One of these is the dual assignment of the Chief of Staff as General of the Field Armies. From the standpoint of necessary organization the objection does not impress us as being of great importance. For peace-time operation this dual relationship need cause no worry, indeed at present it has significant implications of accomplishing a superb end. As to war-time assignment, we cannot recall a major emergency when the President himself did not select the commanding general of the armies in the field. We imagine that the policy will not be changed as wars come and go: if the then Chief of Staff is the choice of the then President he will be in command of the field army. That must be left to the Chief Executive who has a major war on his hands.

Commenting on the new organization, Maj. Gen. Johnson Hagood, who now commands the Seventh Corps Area and the Fourth Field Army, is quoted by the *Omaha World Herald* as follows:

"Under the recent orders of President Hoover, General Douglas MacArthur, in effect, becomes the commanding general of the United States Army. In addition to his duties as chief of staff he is placed in command of the group of armies—the first, second, third and fourth—recently organized with headquarters in New York, Chicago, San Antonio and Omaha, respectively.

"This organization of a group of armies marks a new epoch in national defense. From the time of Washington to the time of Miles, the Army always had a commander and, if at any time it had a chief of staff, as in the case of Halleck during the Civil War, the latter was an official of secondary importance. As time went on the office of the adjutant general grew in power until finally, at the time of the war with Spain, General H. C. Corbin, the adjutant general, became the de facto head of the Army. Issuing orders in the name of the Secretary of War, he entirely eclipsed General Miles, the lawful army commander, whose authority became so circum-

scribed that all he could do was to prescribe his own uniform. Out of this Mr. Elihu Root, then Secretary of War, proposed a general staff, with a chief of staff as the mouthpiece of the Secretary of War.

"Offices of both the commanding general and of the adjutant general were abolished. For the latter was substituted the office of military secretary. The powerful General Ainsworth, head of the record and pension bureau, took the office of military secretary and, a few years later, succeeded in getting the title, adjutant general, restored. The Wood-Ainsworth controversy ensued, and Ainsworth was forced upon the retired list.

"Congress conferred upon Pershing the office of 'General of the Armies,' but after the war, when he was made chief of staff, he did not exercise any command in his own name but functioned only by order of the Secretary of War. Now for the first time in history, America has a military man—a soldier—who commands the armies and at the same time operates as chief of the general staff and as military adviser to the President and Secretary of War."

Somewhat Disappointing

JUDGED by the first few press installments of General March's book of reminiscences, the American military record of the World War will not be written in the fullness and breadth of vision it demands. For years it has been obvious to students of the subject that in addition to the official and personal writings of many men who were called to public service in or with the Army during the war that the narratives of three high officials were indispensable to the complete military picture—those of Secretary Baker, General Pershing and General March. The Baker record as written is a masterpiece—the mere fact of its unfettered compilation by Mr. Palmer, to whom all the data were available without hindrance by the former Secretary, is proof of the impartial and open viewpoint on which it is based. General Pershing's volumes too meet the requirements of the record even though some of the criticisms they contain are not always based on an understanding of the home front. Certainly the Pershing strictures of ordnance, for example, would have been made in better grace had there been a keener realization on his part of the sincerity of effort in prewar days, the intensity of the battle at home and an understanding of the achievement in furnishing raw materials here and matériel through our Allies abroad.

Mindful of the danger of passing judgment before the March volume is at hand, one may quite appropriately observe that these much-heralded memoirs in their opening chapters are somewhat disappointing. What easily could and should have been approached in the magnanimous spirit displays too often a petty, narrow viewpoint. The thesis seems to be that General March won the war. Generations to come might have so believed and they might have good grounds on which to base a great part of that belief. Most of us today are not so much concerned about the honors envolved because we have not forgotten that it was not a one-man affair. Thousands of the best in America were giving their best at home and abroad with no thought then or now of that elusive and meaningless thing—credit. They did not think then and they will not be led to believe now that argument over military lollipops is the proper approach of the lowliest doughboy much less the wartime Chief of Staff. Instead of a record of detailed achievement we are told that the windows of the War Department were dark at night until General March arrived on the scene. Instead of a real appraisal of the great industrial organization so hastily set up and functioning, the author infers that "these war boards" were ineffectual until he whipped them into shape. Instead of stressing the splendid teamwork of all hands and noting the occasions where and why it lagged, the former Chief of Staff devotes paragraphs to show that Pershing was his subordinate, that Pershing was no diplomat, etc.

What a glorious opportunity for real achievement missed, even in these Sunday supplement versions. Here was the chance for the befitting completion of the record. But General March, at least in the opening rounds, does not rise to the occasion. Granted that he is not a "yes-man" it would have been better had a "no-man" advised him—and the advice heeded—as to the spirit and approach of the really worth while historic book his should be. We can only hope that the book itself taken in its entirety will dispel the concern which the advance chapters in the press have caused many of General March's staunchest admirers.

Soldiers First

THE doctrine that the ordnance specialist in the Army is first and foremost a soldier—a teaching now so practically demonstrated by the troops under the command of General Brown in the Panama Canal Department—is so correct that one may question how and why it ever came into even slight disuse. By way of confession and avoidance it should be said that one cause prevalent a decade ago was the reliance placed by congressional and administrative officials on the enlisted specialist being everything else first and a soldier last. In prosperous days when economy demanded that pencils be sharpened and paper clips be preserved until it hurt it was only natural that soldiering by the specialist was appraised as a somewhat useless occupation. Hence where there was question of a fire guard or maintenance service the job was put on the enlisted specialist with the result that his myriad avocations soon made of his real vocation—i.e., of *soldier* and specialist—anything but that. A system was creeping in which threatened the perpetuation of that valuable institution in the Army—the trained soldier specialist who knows the requirement of the first half of his title as well as the second.

Happily the change has come as is recounted elsewhere in this issue. The Panama Canal Department under General Brown has started the ball rolling and it has already rolled to the point where the results achieved in the Canal Zone are the rule and not the exception for our soldier-specialists throughout the Army. It is sound doctrine and therefore correct. It can be applied with equally beneficial results to the civilian components of the Department—particularly at reserve corps training camps. Advocates of an Ordnance contingent always on its toes will not stop at the training of the soldier specialist. They will urge that in training the specialists of the Reserve Corps the military end be not submerged or entirely overlooked. We move that every training camp for our reservists include in the daily curriculum a period of close order drill with the rifle. Our officer specialists will be better officers and better specialists for it. They also should be prepared to move the regal chair, to which General Brown refers in his comment on Lieutenant Donald's splendid article in this issue.

A Challenge to Munitions Preparedness

An Editorial

INTERNATIONALISTS for years without number have leveled their attacks on national defense at our Army and Navy in general terms. Occasionally the barrage is turned loose on particular activities of both services. At one time it is cruiser strength, at another R.O.T.C. training in the schools, at another the alleged prohibitive costs of the great Frankenstein, "armament." Like lightning in the summer sky these pacifist shafts strike here and there, sometimes to scorch but mostly only to amuse.

Thus far the sensible doctrine of industrial preparedness has escaped serious challenge from all quarters. Excepting the weak but insidious attack in the recent book "Scientific Disarmament" there has been little or no quarrel with industrial preparedness. Every one, even the conscientious objector, has conceded the wisdom of a system of munitions readiness which costs next to nothing, assures some semblance of order, speed and efficiency in producing the implements of protection when needed, and guarantees the absence of militarism both as to large standing forces and excessive armament. This ideal plan is now challenged. "Industrial preparedness should be outlawed! The way to prevent war is to keep our peace-time industry in the dark on munitions." So, in effect, says Dr. Raymond L. Buell, an official of the Foreign Policy Association.

SPEAKING on behalf of his internationalist organization at the recent sessions of the Institute of Politics at Williamstown, Dr. Buell, according to *The New York Times,* said that the abolition of aggressive weapons such as poison gas, bombing planes and tanks would mean little unless the peace-time production of these weapons was also controlled. It would be little good, he said, to abolish tanks if the munition companies (sic) remained free to make as many as they pleased. Since, fundamentally, the limitation and reduction of weapons of war depends on the control of industry, Mr. Buell suggested on international agreement to provide for the abolition of industrial mobilization.

Quoting the speaker, the *Times* continues, "Instead of gearing-up our factories in peace time for instant conversion in time of war, every government should agree to increase the conversion lag. The United States was a highly industrialized nation in 1917, but, because it had no industrial mobilization plan, it took nearly eighteen months to convert its industry onto a war-time basis. The National Defense Act of 1920 has attempted to reduce this lag in favor of instant mobilization. *This is a type of preparedness which is just as dangerous as a large standing Army.* (Italics ours.) If all nations agree to abolish industrial preparedness, including research laboratories for new weapons, the conversion lag will be increased, and they will be more willing to arbitrate disputes than to fight."

For sponsoring the most malefic of all the pernicious attacks on national defense thus far advanced, this spokesman of the Foreign Policy Association takes the cake. The arbitrationists would prevent war by increasing the time lag of plant conversion. They would add one more ghostly sanctionless international armament agreement to the long catalogue and forbid the factory to consider its product as of possible use in war. We had thought that industrial preparedness in theory and practice was so sane that it needed no debunking. And we still think so. Even though Dr. Buell advances buncombe it may be fitting to offer fact in refutation. If there are serious minded followers of his who are sincerely deluded, they ought to be set right. One way of doing it should be to recall what happened and what could have happened in 1918, and what might easily happen again. It is not a long story but it has a long and lasting moral.

INDUSTRIAL preparedness was unheard of before the World War. Other than a half-dozen steel plants engaged on occasional armament orders, and about as many inventors, no one in the United States outside the defense services knew much, or cared for that matter, about the commercial production of munitions in an emergency. In military armament alone General Crozier, Chief of Ordnance of the Army, year after year urged upon a deaf Congress that something be done. Nothing constructive was done along this line and the World War proved to our sorrow the absolute need that American industry in peace keep up-to-the-minute on munitions requirements in war. The National Defence Act gave the sanction of law to munitions planning. *The deadliest and costliest war in the history of the world furnishes the argument for industrial preparedness.* And it proves that those who are preaching a greater conversion lag, may be wolves in sheep's clothing! Our World War ordnance program alone cost $4,087,347,000 or 28 per cent of our total Army bill of $14,244,061,000. More costly still were the 122,500 American lives lost, of whom 48,909 were killed in action or died from wounds.

For a period of 25 months the World War cost the United States considerably more than $1,000,000 an hour. As Colonel Ayres has put it, our expenditure was sufficient to have carried on the Revolutionary War continuously for more than a thousand years. Of our grand total expenditure of $23,500,000,000, the Army was responsible for 64 per cent. And yet authorities on the subject—and the Foreign Policy Association is not one—have said that if we had had our present industrial preparedness set-up when we entered the World War, the munitions cost probably would have been halved. With the munitions program reduced by industrial preparedness, the entire time factor is lowered and all costs in life and money drop proportionately.

Quite appropriately though the Foreign Policy Association boldly introduces speculation that disregards experience. The Buell plan presupposes an international inhibition that wars will be no more—on the assumption, apparently, that the day is here when the lion will lie down with the lamb forever. Our plain-spoken philosopher, Will Rogers, has answered that better than we can. He said "You can't hire a nation not to buy a gun if they think they need one any more than you can bribe folks not to carry an umbrella on rainy days." A look at the map, the western hemisphere as well as the eastern, gives no great proof that the god of war is worried about a drought. Liddell Hart is right: "Any reasonable man must hope that war will have no future; but experience does not lend encouragement to the hope."

Re-elected Officers and Directors of the Army Ordnance Association

Vice-President
William W. Coleman
Milwaukee, Wis.

Assistant to the Chief of Ordnance, U. S. Army, 1918. President, Bucyrus-Erie Company. Chairman, A. O. A. Committee on Awards, 1931.

President
Benedict Crowell
Cleveland, Ohio

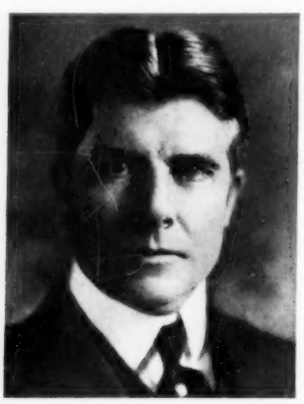
The Assistant Secretary of War and Director of Munitions during the World War. Chairman of the board, Crowell and Little Construction Company.

Vice-President
William C. Spruance
Wilmington, Del.

Chief, Explosives and Loading Division, Ordnance Department, 1918. Vice-President and Director, E. I. duPont de Nemours & Company.

Director
Robert P. Lamont
New York, N. Y.

Chief, Procurement Division, Ordnance Department, 1918. President, American Iron and Steel Institute. Former Secretary, Department of Commerce, of the United States.



Director
Frank A. Scott
Cleveland, Ohio

Chairman, General Munitions Board and War Industries Board, 1917. Chief, Cleveland Ordnance District, 1924-28. Honorary advisor to Army Industrial College, 1925.

Director
Charles L. Harrison
Cincinnati, Ohio

Chief, Cincinnati Ordnance District during and since the World War. Former President, Board of Sinking Fund Trustees, City of Cincinnati. Chairman, A. O. A. Committee on Awards, 1932.

Association Affairs

Biennial Election of Officers

THE biennial election of officers and directors of the Army Ordnance Association was held in accordance with the Constitution and By-Laws Tuesday, September 6, 1932. The following officers and directors previously nominated were reelected: Officers (for the term January 1, 1933, to December 31, 1934): President: Benedict Crowell; Vice-Presidents: William W. Coleman and William C. Spruance; and Directors (for the term January 1, 1933, to December 31, 1936): Frank A. Scott, Robert P. Lamont and C. L. Harrison. The nominating committee consisted of: Maj. Gen. C. C. Williams, U. S. A., Ret., Chairman; J. Rogers Flannery, Theodore Swann, D. C. Jackling and F. J. Buffington. Those serving on the Committee of Tellers of Election were: D. A. Gurney, Chairman; Frank J. Jervey and J. Clinton Tribby.

Plans for the Annual Meeting

THE announcement that Hon. Newton D. Baker, Secretary of War, 1916-1921, will be the principal speaker at the 14th Annual Meeting of the Association to be held in New York City, Wednesday, December 21st, will meet with the hearty approval of all members of the Association. Secretary Baker has kindly consented to address the Association on this date. The meeting will be held under the auspices of the New York Post and is in lieu of the usual gathering in Washington and at the Aberdeen Proving Ground. As previously announced the Aberdeen meeting this year is postponed.

At this writing detailed announcement of the place of the December meeting cannot be made. A committee is now at work on this and other phases of the program and ample notice will be given all members in due course. At this meeting the newly reëlected officers of the Association will be installed for their respective terms and the Ordnance Medal of Merit will be conferred upon candidates recently selected as announced below.

Through the courteous coöperation of Brig. Gen. Samuel McRoberts, President of the New York Post, and the officials and advisors of that group, plans for the meeting are progressing. There is every indication that there will be an exceptionally large attendance at this function to greet the reëlected officials, to hear the war-time Secretary of War and to congratulate the medalists and to transact other business of the meeting.

Ordnance Medalists, 1932

THE Directors of the Army Ordnance Association having unanimously approved the recommendations of the Committee on Awards, announcement is made that the Ordnance Medal of Merit for 1932, founded last year by the Association, will be conferred upon the following:

For leadership and administrative ability in the progress of munitions preparedness to Col. Frank A. Scott of Cleveland, Ohio;

For unusual accomplishment and outstanding service in the advancement of industrial preparedness to Brig. Gen. C. L'H. Ruggles of Charleston, S. C.:

For invention, design, development and manufacture of military armament to Brig. Gen. John H. Rice of Pelham Manor, N. Y.

The awards will be made at the 14th Annual Meeting of the Association to be held in New York City, December 21, 1932.

The Committee on Awards appointed by the President, which unanimously selected the above candidates, consisted of Charles L. Harrison, Chairman, Cincinnati, Ohio; Pliny E. Holt, Stockton, Calif.; and James L. Walsh, Detroit, Mich.

All members of the Association will join in hearty approval of the recommendations of the Committee and in congratulation to the recipients whose outstanding service to Ordnance in particular and to the national defense in war and peace are well known to all members.

Further detailed account of the achievements of the candidates will be published in the November-December issue of this Journal.

Major Barnes Awarded Welding Prize

MAJ. G. M. BARNES, Ord. Dept., U. S. A., chief of the Design Section at the Aberdeen Proving Ground, Md., was awarded second prize of $3,500 in the Second Lincoln Arc Welding Contest, the results of which were announced recently. Some 400 papers were submitted from eight different countries. The paper which was awarded first prize was the work of two naval officers. The prize-winning papers are later to be published in book form by the American Society of Mechanical Engineers.

ARMY ORDNANCE joins in congratulations upon this well merited distinction to one who is a frequent contributor to these pages and whose engineering ability in the design and manufacturing technique of ordnance are well known in this country and abroad.

T. E. Moritz Breaks All Records

MR. THEODORE E. MORITZ, an official of American Steel Foundries, Chicago, is performing a service of unusual significance in coöperation with the Membership Committee of the Association. In the last issue of this Journal the Committee tendered special thanks to Mr. Moritz for his splendid assistance in enrolling new members of the organization. During the past five months Mr. Moritz has procured eighty-three new members, many of whom are among the outstanding civilian industrialists and engineers of the country.

The Committee has conferred upon Mr. Moritz the gold medal of the Association for his exceptional interest and energy and takes this means of again publicly acknowledging its thanks and appreciation. Mr. Moritz is proving beyond doubt that despite the difficult times there are many patriotic individuals in American industry who are anxious to further the Association's efforts for industrial preparedness.

Capt. C. E. Hoover Wins Pistol Trophy

CAPT. CHARLES EMMETT HOOVER, Ord. Res., 627 Linden Avenue, Johnstown, Pa., a member of the Army Ordnance Association, was the winner this year of the New York Ordnance District pistol trophy. He was on active duty training at the Aberdeen Proving Ground during the Officers Reserve Corps Camp from July 24th to August 6, 1932. His record at pistol marksmanship qualified him as an expert, and in the shoot-off to determine the winner of the trophy he obtained the very commendable score of 96 per cent. This is an unusual record and probably will stand unbeaten for a long time.

The trophy, a silver loving cup, was presented by reserve officers of the district two years ago as an evidence of their appreciation of the assistance of regular officers at training conferences and summer camps. It is competed for each year by reserve officers in attendance at the Aberdeen Proving Ground summer training camp. On the trophy is engraved the insignia of the New York Ordnance District and the following inscription, "Pistol trophy, Aberdeen Proving Ground, Ordnance Reserve Corps Camp." On the reverse side are engraved the names of the winners of the regular record pistol shoot conducted during the camp. The trophy is permanently retained at the Proving Ground.

Necrology

SINCE publication of the last issue of Army Ordnance notice has been received of the death of the following members of the Association: O. W. Barger, Newark, N. J.; Joseph B. Hoon, Cleveland Heights, Ohio; H. Newton Lowry, Washington, D. C.; H. T. Porter, Greenville, Pa.; John M. Satterfield, Buffalo, N. Y.; and O. J. Teeple, Edgemoor, Del. To the relatives and friends of these deceased members the Association extends condolences.

Magnus W. Alexander

MR. MAGNUS W. ALEXANDER, President of the National Industrial Conference Board and an active member of the Army Ordnance Association, died suddenly at his home in New York City, September 10, 1932. Long a leading exponent of industrial preparedness, Mr. Alexander had participated in many activities of the Association and his writings have appeared frequently in these pages. He was one of the principal speakers at the 13th Annual Meeting of the Association last October. His excellent address, "Industry In Our Preparedness Program," was published in the November-December, 1931, issue (Volume XII, No. 69).

Identified as the spokesman for some of the nation's greatest industries, Mr. Alexander as President of the Conference Board was an authority on economic, engineering and industrial questions. He was born in New York February 17, 1870, and studied mechanical, metallurgical and electrical engineering at Vienna, Leoben and Gratz, Austria. Upon his return to this country he became a design engineer for the Weston Electrical Instrument Company and later joined the Westinghouse Electric and Manufacturing Company and subsequently the General Electric Company. For eighteen years he was engineer in charge of design for the latter organization, and in 1918 was made "engineer on economic issues" in a consulting capacity. In 1916 he helped organize the National Industrial Conference Board devoted to industrial planning and research.

In his address at the last annual meeting of the Association Mr. Alexander concluded his remarks by saying, "The old adage, 'In time of peace prepare for war,' still holds good, but in the practice of this preachment the emphasis has shifted. At present the stress is placed on the maintenance, not of large-scale military establishments in peace times, but of a smaller, highly integrated and efficient organization in which the tactics of industrial production and the tactics of military science are closely joined and military and industrial leaderships pursue a common task." Mr. Alexander tirelessly practiced this doctrine and was an important factor in translating it into action. His genial manner, broad learning and ability will be missed in the ranks of industrial preparedness advocates.

New Members

THE following have been admitted to membership in the Army Ordnance Association since the last issue of Army Ordnance: Joseph A. Adley, East Chicago, Ind.; A. B. Alpirn, Omaha, Neb.; B. H. Anglin, Chicago, Ill.; James M. Austin, Chicago, Ill.; Joseph D. Baker, Baltimore, Md.; Paul L. Bartow, St. Petersburg, Fla.; F. W. Bauer, Chicago, Ill.; Earl L. Brokenshire, Cleveland, Ohio; T. C. Carhart, Wilkinsburg, Pa.; Lyon Carter, Boston, Mass.; E. J. Coffey, E. St. Louis, Ill.; Laurence H. Coffin, Argentina, S. A.; Charles S. Cook, Detroit, Mich.; J. S. Coxey, Jr., Youngstown, Ohio; W. B. Crane, Chicago, Ill.; E. F. Cunningham, Penns Grove, N. J.; A. L. D. D'Adrian, St. Louis, Mo.; Douglas J. Early, Birmingham, Ala.; G. R. Elder, Radford, Va.; E. L. Essley, Chicago, Ill.; John W. Floto, Chicago, Ill.; J. L. Foerster, St. Louis, Mo.; R. H. Fox, Denver, Colo.; Fred S. Fuld, St. Louis, Mo.; James Gerity, Jr., Toledo, Ohio; J. C. Gore, Chicago, Ill.; Charles E. Hoover, Johnstown, Pa.; Hjalmar Kinberg, Ross, Calif.; L. P. Kulka, Alliance, Ohio; Clarence C. Lakin, Chicago, Ill.; Irvin F. Lehman, Pittsburgh, Pa.; A. R. Ludlow, Mill Neck, N. Y.; Harry B. Mathews, Jr., Alton, Ill.; H. G. Mouat, Birmingham, Ala.; Jules Muller, Chicago, Ill.; C. N. Nau, Hammond, Ind.; C. H. Newcomb, Philadelphia, Pa.; F. J. O'Brien, Milwaukee, Wis.; Joseph Paper, St. Paul, Minn.; Clarence S. Petty, Bogota, N. J.; J. W. Potter, Jackson, Ohio; Arthur M. Price, Chicago, Ill.; C. G. Raible, Cleveland, Ohio; L. C. Rathsburg, Chicago, Ill.; Max L. Roessel, Yonkers, N. Y.; Frank Samuel, Philadelphia, Pa.; W. Stewart Scott, Crafton, Pa.; Kenneth Seaver, Pittsburgh, Pa.; H. B. Siebe, New York, N. Y.; A. F. Spring, Cleveland, Ohio; H. D. Stalnaker, Pittsburgh, Pa.; Tom G. Waugh, Chicago, Ill.; Herbert L. Weith, Chicago, Ill.; James D. White, Chicago, Ill., and R. A. Williams, Webster Groves, Mo.

Association Membership

OVER 90 per cent of the membership of the Army Ordnance Association consists of executives and engineers of American industry who are cognizant of the importance of industrial preparedness. These gentlemen who, through affiliation with the Association are kept informed of current development of munitions, constitute a large portion of the civilian nucleus upon whom our Government will depend for the manufacture of ordnance in time of emergency. The membership qualifications are:

"Article III, Sec. 1. Full membership in the Association shall be open to all men who are American citizens and who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production manufacture, inspection, test or supply of Ordnance material.

"Sec. 2. Life membership in the Association shall be open to all men who are American citizens and who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material.

"Life membership shall continue during the lifetime of the life member and shall expire at death. It shall not be transferable.

"Sec. 3. Student membership in the Association shall be open to all men who are American citizens and who are students in technical schools or colleges. Student members shall not vote or hold office in the Association.

"Sec. 4. Group membership in the Association shall be open to all individuals, firms, companies and groups controlled by American citizens who are interested in promoting the cause of industrial preparedness, particularly in connection with the design, procurement, production, manufacture, inspection, test or supply of Ordnance material.

"Group members shall have the privilege of nominating ten men for full membership in the Association, and members thus nominated shall pay no dues.

"By-Laws. 5. The fee for life membership in the Association shall be One Hundred ($100.00) Dollars. The annual dues for membership in the Association shall be, for members, Five ($5.00) Dollars; for student members, Two Dollars and Twenty-five Cents ($2.25); and for group members, One Hundred ($100.00) Dollars, payable in advance. These sums are in addition to whatever dues or assessments may be imposed by the respective local posts in the case of members."

Communications

The Error of a Latin Engineer

THE EDITOR:

Recently while looking over some early history of water supply systems I came across one written by Sextus Julius Frontinus about the year A. D. 97. A cross reference led me to another of his works written about 84 A. D. under the title "Stratagemata."

In order to develop your curiosity in the latter book I shall quote you from two of the opening paragraphs:

Book I.—"Since I alone of those interested in military science have undertaken to reduce its rules to system . . ." after which he gives many of the problems of his day with illustrations of methods used by many commanders in solving them.

Book III.—"Laying aside all consideration of works and engines of war, the invention of which has long since reached its limit and for the improvement of which I see no further hope in the applied arts. . . ."

There should be a lesson in the quotation from Book III to those of our day who consider expenditures of funds for experimental or development work as unnecessary. Frontinus had that point of view some 1850 years ago and he was one of the leaders of his day and still there has been some considerable change since.

HENRY B. MACHEN,
Col. Ord. Res., U. S. Army.

New York, N. Y.

Principles of Firearms Identification

THE EDITOR:

In reading my article, "Principles of Firearms Identification," which was published in the July-August 1932 issue of ARMY ORDNANCE, I find that I made an error. On page 43, in the paragraph directly below Fig. 17, the revolver referred to as a Colt should have been a Smith & Wesson.

Figure 17 is a comparison photomicrograph of the corresponding grooves on test and fatal bullets showing the effects of the accidental characteristics existing on the surfaces of the land and land shoulders in the suspected Smith & Wesson revolver. The lands in the bore of the weapon form the grooves on the surface of the bullet and so the title appearing with Fig. 17 is not strictly correct.

CHARLES O. GUNTHER,
Lieut. Col., Ord. Res., U. S. Army.

Grand View-on-Hudson, Nyack, N. Y.

Economy and the Army

THE EDITOR:

Colonel Mettler's article in the July-August number of ARMY ORDNANCE in reply to my "Economy and The Army" in the preceding number seems to call for some reply.

First he has suggested that my unfavorable criticism of the National Defense Act is not intended to be taken seriously and is inconsistent with other writings of mine setting forth our national military requirements. If he can find in my writings any such inconsistency then I will be happy to acknowledge it; otherwise I respectfully submit that his sweeping statement is one hundred per cent incorrect. As to seriousness, if a service journal like ARMY ORDNANCE, independent of public funds and not staffed by regular officers, be not the place for serious military discussion, then what is the place for such discussion?

In substance, the argument of my distinguished opponent is merely that the Army is doing the best it can with the policy under which it is compelled to work. This I have never doubted for a moment. The comedy of the situation has nothing to do with officers loafing on their job; those who know regular officers are well aware that they compare favorably for diligence and professional standard with other professional groups. The comic opera element is the grotesque disproportion between regular officers and regular enlisted men.

It is also proper to note that regular officers on active duty are not free to make public any unfavorable opinions they may have of present policies; they can no more do so than Roman Catholic priests can dissent from an *ex cathedra* statement by the Pope.

The whole case for the National Defense Act would seem to be as follows: since the beginning of the Democratic era in Europe in 1793, the horde or mass army has been the instrument of maximum military effort. We ourselves raised such armies in the Civil War and again in the war against Germany. A first class military emergency may again occur and the National Defense Act provides us with the cadre or framework which would then be necessary to meet such an emergency.

To this I reply: first, the mass army is unsuited to the geographical position and the policies of the United States; second, even if such an army is necessary to our needs, it is not being effectively prepared by the present Act.

To assume that in future wars the plane and the tank will permit the mass army built around its unarmored infantry to remain the vehicle of maximum military effort, would seem doubtful enough. But even on this assumption the geographical position of the United States and the impossibility of suddenly preparing a naval and military coalition strong enough to invade us remove all reasonable probability of our suddenly needing an enormous army for use in North America. Other nations therefore are justified in believing that we are preparing to use such a force on some other continent. If anyone wishes to argue that the vital interests of the United States are such as to make this reasonably probable, then the reasons for so wild a statement should certainly be given.

Next, the National Defense Act does not effectively prepare for a horde army. Such an army requires not only a cadre of officers but also large reserves of trained enlisted men, and covering forces instantly available to protect the assembly of those reserves. Except for the National Guard, we have no trained reserves on which the government could immediately count to answer a call. The Regular Army is so morcellated out into tiny detachments for giving a little training to high school boys and collegians that it could not immediately provide a modest covering force of four divisions. Our cadre of officers cannot be efficient because it lacks a suitable number of enlisted men upon whom to practice the fundamental art of troop leading. Is this a tolerable situation? Very earnestly I maintain that it is not.

Moreover these facts and much more are widely known. William T. Stone of the Foreign Policy Association has recently published a report which goes far beyond any statements of mine in hostility to the National Defense Act. Let us have first of all a well balanced Regular Army, supplied with modern equipment instead of our present force top heavy with officers. Rational defense of the military situation now existing under the National Defense Act would seem so difficult as to invite political attack.

HOFFMAN NICKERSON.

Oyster Bay, Long Island, N. Y.

THE EDITOR:

I hope ARMY ORDNANCE intends to continue such discussions as "Economy and The Army." I do not know of any other publication with industrial and military readers which can perform quite as valuable a service. If I may be permitted an inquiry may I ask Colonel Nickerson what he thinks of building up some of the "obsolescent" branches of the military service by transfer of personnel to the "newcomers" (armored vehicles, chemical warfare, industrial mobilization, etc.) where they are badly needed. In that way much good would be accomplished.

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Professional Notes

Training Courses for Ordnance Reservists

IN addition to the usual summer training camps for Ordnance reserve officers conducted at the arsenals and depots under the jurisdiction of the Department, unusual interest attached this year to the courses conducted in several of the larger universities and at the Raritan Arsenal. The form of instruction inaugurated at the Stanford University several years ago has become exceedingly popular and under the guidance of the ordnance members of the faculty and the regular officers of the Ordnance Department the course at Stanford has assumed an important place in the Ordnance training schedule. The newcomers in recent years among the institutions at which ordnance training centers are held are those at the University of Michigan and Massachusetts Institute of Technology.

UNIVERSITY OF MICHIGAN

THERE were thirty-six Ordnance reserve officers in the group which assembled at the University of Michigan for the period July 31 to August 13, 1932. Three courses were designed to introduce them to the problems which would arise in the manufacture of artillery ammunition. One course was based on the ordnance specifications for forgings and embraced an elementary study of the metallurgy of steel so that the officers might have an intelligent understanding of the specifications. Another course was on gages and gaging as applied to the manufacture of shell. A third course was on explosives and the problems of loading. A rather small group who were more proficient than the others received advanced instruction in metallurgy and a few of the older officers were asked to make a preliminary study of some of the problems involved in selecting the site for a loading plant. The whole group of officers also received instruction on military contracts and administration, and on alternate afternoons were given opportunity to qualify as marksmen on the pistol range. On the last day there were brief written examinations on the theoretical courses.

The administration of the Training Center was in the hands of Colonel A. H. White, Ord. Res., Commanding Officer, and Major R. N. Bodine and Captain A. B. Custis of the Ordnance Department of the Regular Army, with Captain C. B. Peirce, Med. Res., as medical officer.

The administrative staff also acted as teachers and were assisted by three professors in the Engineering College of the University of Michigan who were also reserve officers—Majors C. Upthegrove, J. C. Brier, and F. A. Mickle. There were also three special lectures by Col. H. W. Miller, Ord. Res., who rapidly traced the development of artillery from its earliest period to the super-artillery of the World War and gave some consideration to the factors which now limited further development.

Captain Custis made arrangements for housing the single men in one fraternity house and the married officers and their wives in a second house. Meals were served to the whole group in the house where the bachelors were quartered. The day commenced at 6:15 with setting-up exercises in the gymnasium followed by a shower and swim. The first class met at 8:15 and classes continued till 4 o'clock with an interval for lunch.

Provision was made for golf and tennis and the officers organized their own committees for social functions. Field uniform was required throughout the day and there seemed to be general agreement that it increased the morale and seriousness of the group and added materially to the effectiveness of the routine.

At the close of the center, the officers were asked to take a few days to consider the matter and then write their criticisms and suggestions for another year. The comments which have been received have indicated that the officers believe the program gave them an introduction to the manufacture of artillery ammunition which would be helpful in case they were called to active duty and assigned to that work.

COL. A. H. WHITE,
Ord. Res., U. S. Army.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

THIRTY-EIGHT officers of the Ordnance and the Specialist Reserves availed themselves of the summer training course given this year at the Massachusetts Institute of Technology at Cambridge from August 14 to 27.

The courses started at eight in the morning, and comprised a variety of subjects, which were elective to the officers attending. Practically everybody took the "military course," so ably given by Majs. O. J. Gatchell and Roger Taylor of the Ordnance Department. The officers were kept abreast of the latest developments and planning in Washington and were informed of the plans of the Assistant Secretary of War's office, and its work in conjunction with the General Staff. Up-to-date information was also given on such basic subjects as military courtesy, military law, civil service, and organization of the Army. Maj. David A. Lenk's course on inspection and gages, and Maj. Earle Buckingham's courses on production methods drew a large enrollment, and received enthusiastic comments. Capt. John H. Zimmerman interested a number of officers in his courses in industrial heat treatment and materials of engineering and specifications, and great satisfaction in having acquired new and useful information was expressed by them. Lieut. Col. Robert C. Williams interested some specialists in his course in physical metallurgy, and managed it so well that the officers in his charge were highly pleased with their selection. Capt. Henry W. Underwood, Jr., had a larger group than ever in his subject, powder and explosives, which included a number of interesting laboratory tests and preparations. Maj. Clark S. Robinson presented a course in plant design, and at the request of those taking it, gave them all the latest ideas on air conditioning, in which subject he proved himself eminently well qualified, and which he illustrated with many practical problems.

Those officers not taking afternoon courses found a well-rounded program awaiting them. Under the able guidance of Major Buckingham a number of interesting plants in the vicinity of Boston were visited. These included the General Electric Company's plant at Lynn, New England Candy Company, United Shoe Machinery Company, United Carr Fastener Corporation, as well as Watertown Arsenal. Opportunity was also given to the officers to visit the Institute's latest addition, the Spectroscopic Laboratory, and its use in the study of molecular and atomic structures was made clear to the officers.

RARITAN ARSENAL

AFTER experimenting with several methods and plans of training for the Ordnance reserve officers of the Second Corps Area Assignment Group, it was decided the Ordnance Field Service School at Raritan Arsenal, Metuchen, New Jersey, offered the best facilities for this training. The completion of the 1932 summer camp, in July, confirmed the wisdom of the decision.

Plans for this camp were formulated early in January, 1932, and approved by the Commanding General, Second Corps Area, the Chief of Ordnance, and the Commanding Officer, Raritan Arsenal. This being the first camp of its size to be held at Raritan, there were many obstacles to be overcome. Failure of the War Department Appropriation Bill to be enacted until after the camp had started enhanced these difficulties. However, with the coöperation of the school commandant and his staff,

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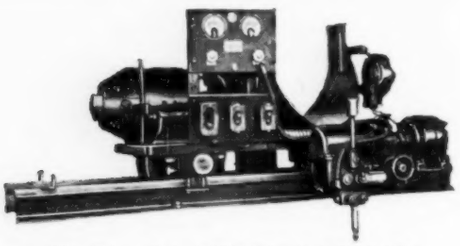

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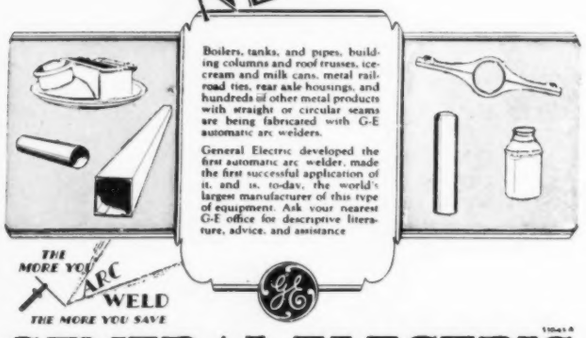
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all difficulties were overcome and the camp started on schedule.

Fifty-five officers reported for duty on July 10th. They were met by Sergeant Daley from Corps Area Headquarters, who was on temporary duty as camp sergeant major. After registering, they were immediately assigned quarters. Camp equipment, including a suit of fatigue clothes, was then issued. Physical examinations, conducted by the post surgeon and a reserve medical officer, assigned for that purpose, were promptly and thoroughly completed. The officers were then organized into a company of two platoons; one for the maintenance group; the other for the ammunition and depot group.

Daily assignments were made to the key positions of the company. A captain was detailed as company commander for each day of the camp; a first lieutenant as officer of the day; and a second lieutenant as first sergeant. Each company commander selected his own platoon commanders for that particular day.

The general training schedule included calisthenics, close order drill, and separate unit instruction for the maintenance and ammunition groups. The afternoons were allotted to a "reduced distance" field problem in ordnance supply. Several exceptions were made to this general schedule. One and a half days were devoted to pistol marksmanship; firing both the preliminary and record courses. Approximately fifty per cent of the officers qualified. One day was devoted to a road march of more than ninety miles. An afternoon was devoted to the inspection of the arsenal shops and to tank driving over rough terrain. An inspection of the company by the Corps Area Ordnance Officer, Lieut. Col. Norman F. Ramsey, followed by a review, injected additional military atmosphere into the training.

Calisthenics and close order drill formed an important part of the schedule. First call at 6:15 o'clock each morning started the day. Reveille at 6:30, followed by fifteen minutes of brisk setting-up exercises put the finishing touches on the breakfast appetite. An officer particularly qualified for this work was selected as physical director.

As most of the officers present were R. O. T. C. graduates or had had some previous military training, the close order drill was conducted for a dual purpose. For the first three days the company was drilled by a competent drill sergeant, furnished by the school. This was for the purpose of toning up the drill and putting snap into the organization. For the remainder of the camp the drill period was used primarily for the purpose of permitting the officers to gain confidence in the exercise of command. The company commander and his selected platoon leaders drilled the company for the first fifteen minutes. Junior officers were then selected to command both the company and the platoons for short periods. In this manner, opportunity was given all to maneuver the company. Noticeable improvement was shown in the manner of giving commands and in the knowledge of the various movements possible for the company.

Unit instruction, in maintenance of ordnance matériel and ammunition, was conducted by the enlisted instructors of the Ordnance Field Service School, under the supervision of Capt. John M. Erwin, of the school staff. The student officers were grouped, according to their corps area assignments, into maintenance and ammunition groups.

The maintenance schedule provided instruction in the inspection, repair, and maintenance of all divisional weapons, from the caliber .30 rifle to the 155-mm. howitzer. To facilitate training the maintenance group was subdivided into two sections; one beginning on small arms and the other on artillery matériel. For instruction on the rifle, pistol, automatic rifle and machine gun, each officer was given a weapon which he disassembled and reassembled, under the guidance of instructors. Instructions and demonstrations were then given in the inspection of these weapons and the proper method of repair procedure in each case was explained.

Instructions in the inspection, repair, and maintenance of artillery weapons and infantry accompanying weapons, were

given in groups of seven or eight officers, working under the guidance of a school instructor. A tour of the school museum was made and the various weapons used during the World War were shown to the class and their use explained. Methods of synchronizing machine guns for aircraft use were demonstrated. An hour or more was spent test firing the ground type Browning machine gun. All stoppages were demonstrated and the proper remedies explained.

The ammunition group was given instructions in the care, storage, and shipment of ammunition and methods of packing and marking. Sectionalized rounds of ammunition and component parts were studied. Storage space requirements, the different types of magazines and other important factors in ammunition storage were covered. Model magazines, methods of storage, and methods of packing for shipment were demonstrated and discussed. Field serveillance and demolition of unserviceable ammunition was demonstrated. A tour of the magazine area and the renovating plant completed this part of the course.

From 1:00 until 4:00 o'clock each afternoon a problem in Ordnance supply and maintenance was conducted. A tactical situation for a field army of two corps of three divisions each, with two cavalry divisions attached, was prepared as a basis for this problem. The tactical situation started with the concentration of the army and progressed through this period to one where a defensive position was occupied. After several days' fighting the enemy was driven back. Reënforced by an additional corps the army took the offensive and attacked the defensive position selected by the enemy.

The purpose of this problem was to illustrate the application of logistic principles to the operation of large units and to test the ability of the officers to function as Ordnance staff officers of an army, corps and division. Actual field conditions were simulated as nearly as possible. Reserve officers were assigned to all key ordnance positions in the army, from that of army ordnance officer to company commander of the various ordnance companies of the army, corps and division.

Each headquarters or echelon was separated from the others. The army ordnance officer with his staff and company commanders were assigned one room in the school building. Each corps ordnance officer, with his assistants and three company commanders were assigned separate rooms. The division ordnance officers of the three infantry divisions of the corps and the attached cavalry division were also assigned space in this room. Division ordnance officers were permitted to call upon their company commanders for assistance in solving the requirements, but could not discuss them with the ordnance officer of adjoining divisions or of the corps.

Lieut. George Devens of the school staff was assigned as problem director. With the necessary assistants, recorders,

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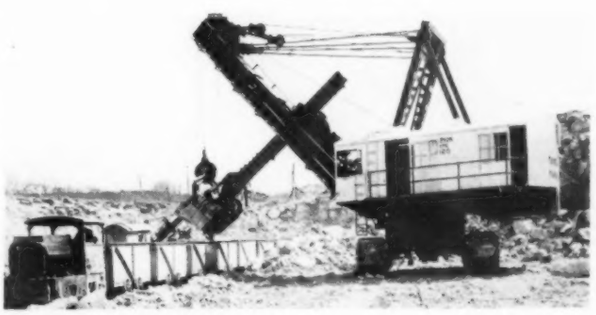

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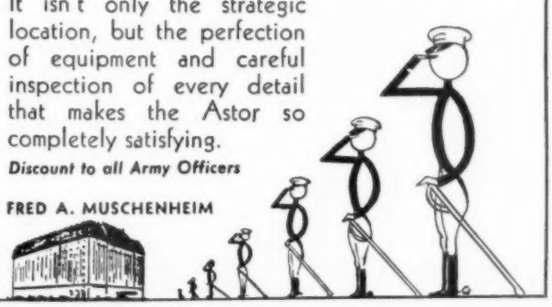

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checkers, phone operators and messengers he issued the various requirements of the problem in the name of the appropriate commander. He supervised the work of the recorders and caused the solution submitted to be checked against an approved solution. A telephone system connected the director with the army ordnance officer and with each of the corps ordnance officers.

Messages were first telephoned, then verified by written instructions. The messages sent out and reports called for covered the principal duties and activities of ordnance officers on duty with troops. They dealt with the selection of sites for necessary installations in the army, corps, and divisions; the calculation of stocks of ammunition and general supplies to be used; inspection to be made; transportation requirements; and maintenance of ordnance matériel. In this manner the student officers became familiar with the ammunition charts, standard nomenclature lists, lists of basic allowances and technical regulations pertaining to the ordnance matériel issued and served. Requirements on inspection principles and maintenance paralleled the training given in the morning on those subjects.

To demonstrate the practical application of the theory taught by the problem, a road march was planned to cover the installations of one corps. No funds being available for this march the officers volunteered the use of their privately owned cars. A convoy was formed and conforming to strict road discipline marched from the arsenal to the position selected on the map for one of the division maintenance company bivouacs. This position was found unsuitable and reconnaissance was made for another position. From the newly selected bivouac the convoy was marched to the points selected for the infantry ammunition distributing points and to the artillery section advanced echelon which was near the artillery ammunition distributing point. An adjoining division area was covered in a similar manner. At each point a discussion was held as to the advantages and disadvantages of that particular place; the vicinity of other divisional installations; the relationship to the front line; and the general division layout. On the return march certain corps installations were visited. The point selected for the army ammunition depot to serve that particular corps was inspected. An hour halt was called at noon and lunch served in the field.

One of the principal factors in the success of the camp was the excellent service furnished by Capt. J. W. Proctor and the non-commissioned officers and men of the 40th Ordnance Company. Upon arrival at camp each officer was assigned a bunk in one of the two large barrack buildings designated for use of the reserve officers. Orderly service was furnished for making beds, policing squad rooms and grounds. The mess was excellent and ample, from the first dinner on the day of arrival to the farewell breakfast on the day of departure.

The recreational facilities of the arsenal added greatly to the enjoyment of the camp. An excellent nine-hole golf course found favor with many of the officers. A membership "for the duration of the camp" was extended by the golf club.

It is worthy of note that the unanimous recommendation of all unit commanders, was for a similar camp at Raritan Arsenal during the summer of 1933. The facilities for training Ordnance reserve officers are unequaled by any other post in the Second Corps Area, and, with the possible exception of Aberdeen Proving Ground, by any Ordnance station in the United States. While it is intended to hold the first year or basic schedule to one which is general in character and similar to the one used this year, it is also planned to offer advanced courses to men who return for the second or third year. These advanced courses are to be based on the training and promotion requirements specified in Army Regulations 140-36. It is believed that with the present excellent coöperation of the Field Service School, these camps will become standardized and will be an increasingly valuable asset to the national defense.

Lieut. C. Wingate Reed,
Ord. Dept., U. S. Army.

AOA

Book Reviews

Red Smoke. By Isaac Don Levine. New York: Robert M. McBride & Co. 1932. $2.00.

MR. LEVINE'S comments on Russian affairs have marked him as an acute observer and a skillful analyst of conditions in the Soviet Republic.

It is therefore no surprise to find that in his latest book, on the Five Year Plan, he approaches his subject from a fresh point of view, minimizing, at the outset, the importance of the vast mass of testimony of recent observers, commentators and propagandists, as being inadequate, inaccurate, and prejudiced. He insists, rather, that optimistic descriptions of work on specific projects shall not be permitted to obscure inherent economic defects in the projects and that Russian progress shall be judged in the light of its conformity with basic economic laws.

In seeking the truth as to accomplishments under the Plan, he discriminates sharply between the text of the Plan as drafted during a long period of years by economic experts, and the political rallying cry, subject to change in a most uneconomic way with every change in the political outlook, which he says the Plan has become under the manipulation of Stalin.

These two plans, according to Mr. Levine, are so dissimilar as to bear no real relation to each other. The original plan was possible of achievement, recognizing as it did the shortages in raw materials and geographic handicaps which nature has imposed on Russia. The political plan, ignoring handicaps, blindly overlooking costs, increasing by huge percentages the loads to be supported by infant industries, and above all, subject to capricious changes whenever political ends are to be served, is, in Mr. Levine's view, quite impossible of achievement, and will end in disaster to the dictatorship, "under pressure of a titanic force cradled by its own blind policies in the depths of Russia."

This thesis is not new. In varying forms it has been the prophecy of exiled tsarists, of discontented political opponents, and of watchful border states. In the past these predictions have proved pointless because they underrated the facility with which the Soviet government could modify its policies and change its tactics to meet threats of failure. Nothing in Mr. Levine's book indicates that the Soviet government has grown less skillful in these exigencies. On the contrary, the very enumeration of the exigencies which have been met and surmounted, implies an economic generalship which is impressive, and such judgment as that Magnitogorsk "will become a non-productive monument to Stalin's folly" seem premature.

The shortcomings discovered by Mr. Levine in the modified Plan may prove fatal to the dictatorship. They have been set forth in "Red Smoke" with the utmost clarity and with an animation which will compel the attention of every student of Russian affairs. But to the reviewer at least, the point still seems less than proved.

Ludendorff, The Tragedy of a Military Mind. By Karl Tschuppik, Translated by W. H. Johnston. Boston: Houghton Mifflin Company. 1932. $5.00.

LUDENDORFF was a great commander of armies. This much is admitted by the author of this book. But he had the limitations characteristic of all experts, and as a military specialist he was ill qualified to determine the political strategy of the World War. Moreover "an incapacity to appreciate an innovation is the common characteristic of all experts." Since "the modern battle of matériel does not admit of the decisive

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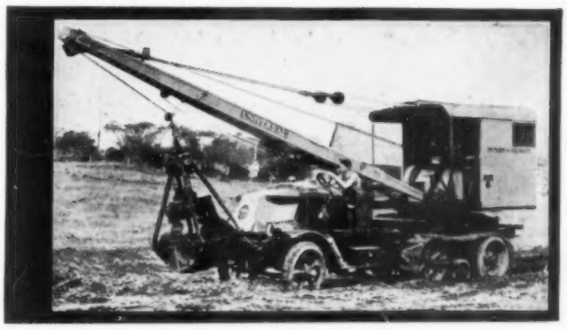

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battle postulated by Schlieffer," i.e., an imitation of Hannibal's strategy at Cannae where the Roman forces were surrounded and destroyed, any attempt to accomplish this in modern warfare is so much wasted effort.

A shoemaker should stick to his last. When, during the two final years of the war, Ludendorff as the real dictator in Germany was able to control political strategy in the face of an inept and impotent Reichstag, of political leaders and a Kaiser who put their faith in the decision of a strong willed soldier, the author deems it a tragic circumstance that ultimately defeated the Central powers. In 1870 Bismarck controlled the generals. In the allied countries the political leaders directed the course of events. In Germany in 1917-18 the government capitulated to Ludendorff, and a succession of political errors ensued. The kingdom of Poland was proclaimed, unrestricted submarine warfare was authorized, other political mistakes aggravated the situation. The outcome, according to Herr Tschuppick is proof "that force without intelligence is doomed to defeat."

This book is an interesting study of a great modern soldier, of warfare and strategy under present day conditions, of the German character and government. It is possible that Ludendorff's fall might have been avoided with effective political guidance. Nevertheless the forces operating were deep-seated and powerful, and with such premises, the ultimate conclusion was apparently inevitable. Whether or not one agrees with the author's diagnosis, regardless of certain inconsistencies, this book makes profitable reading for anyone interested in the fundamentals of national strategy.

Thunder and Dawn. By Glenn Frank. New York: The Macmillan Company. $3.50.

THIS book, although it contains but little that is new or novel in its 389 pages, summarizes the proposals and criticisms which have been presented to the reading public during the past few years, but which Frank expounds in a most forceful, fair and direct manner. While Western civilization, or more particularly American civilization, is depicted as being in a rather sad state, Frank does offer some hope for the future. He tells us our civilization is highly hypocritical; that it has lost faith in progress; that with nothing to be expected in the way of governmental help, political leaders are needed, or men who can assist in planning when a plan for recovery has finally been developed.

The "prophets of doom," among whom Dean Inge and Santayana assume first place with their literature of despair, are in his opinion brought to their present state by biological, psychological, political, economic, administrative and moral fears. This Frank counteracts with a literature of hope, instead of one of optimism, but even here he finds that the former has but little influence at present because the information gathered by science and experience is not as yet prepared for admission into Western social policies. Disaster can be avoided only by (1) A New Reformation, or a "cleaning of the clogged conduits of religious institutionalism" and a "resurgence of religious vitality"; (2) a New Rennaissance which is to embody "a secular movement of social renewal that shall rescue culture from the pedant and poseur"; (3) a New Industrial Revolution which will achieve, under statesmanlike industrial leadership, a correction of the present evils and insure stabilized prosperity, while giving a "guarantee to the many as well as to the few adequate leisure for the cultivation of values that lie beyond economics."

The Germans. By George N. Shuster. New York: Lincoln MacVeagh. The Dial Press. $3.00.

FROM the pen of an American author who has thoroughly studied Germany, both before and after the war, this book describes social, political and economic conditions now existing. It compares these conditions with those obtaining before the war—for the thinking public in a manner which leaves no

doubt in the reader's mind that the German crisis has by no means been settled. Nor is there any doubt that post-war conditions are directly attributable to the Treaty of Versailles, a treaty engineered by statesmen (?) whose sole thought was the complete obliteration of the Germans as a first-class nation apparently without concern as to what such treatment would develop in the future. Almost fourteen years have passed since the cessation of hostilities, and a future which requires the speedy adoption of preventive measures now lies before us.

Shuster says "Just three facts seem of obvious concern to me and my fellow Americans. The first of these is the fact that the financial status of Germany is not in consonance with any thinkable code of international civilization. The second is the fact that, since Europe faces East, the way must be opened for a resumption of Germany's traditional service to that East. The third is the fact that the political and economic security of Europe depends upon what attitude France and Germany decide to take toward each other. I believe that American opinion can have an effect upon all these issues, for the simple reason that all of them virtually concern America."

The resumption of Germany's service to the East is, however, barred at present by the crazy quilt map of hostile states established by the victors. As regards the attitude to be assumed between France and Germany, this has been answered for the present by the building up and fostering of these eastern hostile nations, supplemented by frowning fortresses constructed by France on German borders. What answer can Germany give towards a friendly attitude under these conditions? The answer to the economic situation is just as bad, for here we find that Germany lost at least 40 per cent of her economic, industrial and commercial strength as a result of the war, and she was forced into bankruptcy in 1924 by reason of the charges placed upon her by victorious enemies. From this time on Germany existed by borrowing from Peter to pay Paul, a condition which must end some time.

The book is divided roughly into three parts, first, the basic dependence of present-day Germany on Germany of the past; second, a succinct exposition of the problems now confronting Germany and her attitude towards them; and third, a careful treatment of the existing religious and artistic conditions and movements now obtaining.

Each of the 326 pages of this book is filled with food for thought for those Americans who look forward to the day when international peace and prosperity shall reign. The state of prosperity is, after all, an international one, and its resumption here is certainly bound up with the settlement of the vexing European problems.

Hindenburg. By T. R. Ybarra. New York: Duffield and Green. $3.00.

THIS is a Hindenburg biography in three parts, the first being a terse statement of his youth and as a young army officer; the second covers the period of the World War, and the third as President of the German Republic. The author, in his foreword, says he cannot help making Hindenburg "heavy," but the style of the book is anything but that. The language used is spread before the reader with what is almost levity in many cases, and would probably be more at home on the dramatic stage than in a book which purports the depiction of one of the world's greatest soldiers who in his later years developed into a wise statesman. In fact many portions of the book read like the pronouncements of some of our popular radio announcers. Ybarra tells how the Hindenburg legend, born in the womb of Tannenberg, was propagated and made to live, and he then appears desirous of debunking it.

Criticisms of Hindenburg's plans after assuming supreme command of the German army are, of course, in order, but constructive advice is lacking. The legend cannot be easily debunked.

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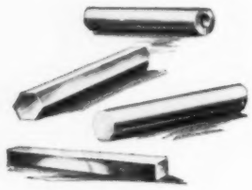

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THE WAR OF THE PACIFIC, 1879–1883

(*Continued from page 105*)

miles of *tapias* parelleling the sea, and the Chileans marched between these lines, from the south instead of the west.

With some of my fellow cadets I used to pore over the battlefield, studying the penetration of the bullets and shell fragments into the *tapias,* and picking up many loaded cartridges, some of which had misfired in the crisis. We found that the .43 soft lead bullets made a penetration of about 1½ inches, at close range mushrooming to a width of an inch. The .50 penetrated much less, and the .57 explosive bullets made a hole 2½ inches deep and 2½ inches across.

But on January 15, 1881, it was not merely rifle fire which overwhelmed the Peruvians at Miraflores. Numbering between 12,000 and 15,000 they were mostly civilians, some not even in uniform, with little or no training, trying to defend their homes. The Chilean official report showed capture during the Lima campaign of 222 cannon, 15,000 rifles and 4,000,000 cartridges, but the supplies were poorly distributed, some troops running out of ammunition, others having the wrong caliber. Attacking them were 13,000 veteran Chileans, inspired by continuous victory, and not only the superior Chilean artillery but a concentrated fire from the captured HUASCAR, the iron-clad BLANCO, and the O'HIGGINS, PILCOMAYO and TORO. The *tapias* were knocked flat in places by the naval guns, the Alfonso Ugarte redoubt silenced, the Peruvian right was shattered and carried with the bayonet. Chilean casualties were officially 502 killed, 1622 wounded; Peruvian unofficially, were again in the disproportionate ratio of 2,000 killed, 1,000 wounded, a total of 6,000 killed, 3,000 wounded in two days.

The unopposed Chilean Army then occupied Lima and, according to Markham, exacted an indemnity of $1,000,000 a month. General Caceres fought on for years in the mountains but the defeat was absolute.

In conclusion, Bolivia lost her entire seacoast and its wealth of nitrate, guano and silver. Peru lost her entire navy, almost her entire army, the disruption of her government, a terrific reign of terror by the criminal element in Lima, the flower of her youth slain at Chorrillos and Miraflores, her customs collections in the occupied ports, enormous tributes in cash, dozens of towns and villages burned, her industry paralyzed for years, the provinces of Tarapaca, Arica and Tacna (the latter returned after more than 50 years) and the nitrate and guano fields which constituted their wealth, and the unparalleled embarrassment of having her postage stamps surcharged with the Chilean coat of arms! A few years after peace the paper money issues had to be repudiated, so thoroughly was she ruined.

However impoverished they may have been, and however they may have felt themselves unable to afford a national defense, the cost of defeat to Peru and Bolivia and the retarding of national growth and development can not be calculated as even a thousand times the cost of a defense that would have prevented such unconditional surrender. Here again is proof that one nation cannot expect another to defend her against a strong foe, and that the efforts of untrained citizen-soldiers with obsolete ordnance, brave enough to defend their homes until the number of the slain is twice the number of surviving wounded, are futile against a well organized military that keeps its ordnance up-to-date.

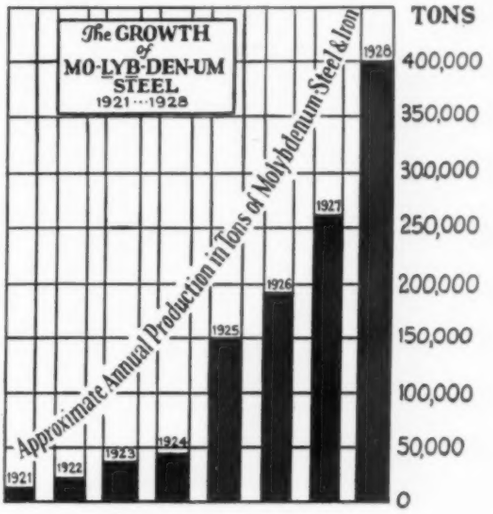
Piezo-Electric Shotgun Pressures

(*Continued from page 101*)

ber pressure. This, of course, was out of the range of the gage. Similar tests on a lot of shells loaded with progressive burning powder having a maximum pressure of 10800 pounds per square inch measured by the piezo gage gave a lead gage measurement of 9000 pounds per square inch. Simultaneous records made by means of the piezo gage show that the pressure on the uppermost layer of lead was equivalent to 12000 pounds per square inch chamber pressure. This increase, of more than 3700 pounds per square inch in the first case and 1200 pounds per square inch in the second case, can obviously be due only to the force necessary to decellerate the piston and a part of the lead cylinder. The large difference indicated in the last experiment does not always exist between piezo and lead measurements of maximum pressures on progressive burning powder.

In conclusion, it may be said that the piezo-electric method of measuring shotgun pressures has several advantages over other methods. The principal ones are: it is amply responsive to record with accuracy any pressure change encountered in shotguns; it can be accurately calibrated, and will maintain that calibration, if simple precautions are taken; it does not have inertia factors which impair its use, and any motion of the gage is negligible.

The Index to ARMY ORDNANCE, *Volume XII, is now available for distribution. It is arranged by subject and author alphabetically and includes title page for binding. Copies of the Index will be furnished without cost upon application to the Editorial Office.*



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